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Intersubjectivity as a Precursor to Literacy: Revisiting the Home-School Study of Language and Literacy Development

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Intersubjectivity as a Precursor to Literacy: Revisiting the Home-School Study of Language and Literacy Development

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Abstract: The oral language skills children develop during the first five years of life are crucial to success in school, especially within the literacy domain. Researchers have identified aspects of oral language that predict, transfer to, or map onto children's later written language abilities. Many researchers studying this topic have taken a social interaction approach by seeking to investigate ways in which early language interactions relate to children's later literacy skills. In quantitative studies, however, this has primarily been done by simply including measures of caregiver talk as independent variables in analyses. By doing this, such studies effectively only measure language *input* rather than language *interaction*, thus undermining the sociocultural framework on which they are based. Sociocultural theory reasons that co-constructed meaning is greater than (and may be qualitatively distinct from) the sum of its parts. This study offers a method to overcome this measurement problem by showing how intersubjectivity can be measured to capture qualities of co-constructed meaning within language interactions. Data from the Home-School Study of Language and Literacy Development were reanalyzed by coding aspects of caregiver-child intersubjectivity. These intersubjective measures were quantified and entered into three separate regression models to test the predictability of parent-child joint meaning-making on children's later reading scores. Results revealed positive, significant

relationships between early parent-child language interactions and children's literacy scores in first grade, thus adding to the knowledge base of the oral language-to-literacy connection and providing empirical support for this new method of quantifying language variables in social interaction studies.

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Chapter 1: Introduction

Learning to read is a crucial milestone in the academic lives of young children, as continued success in school depends heavily upon the ability to construct meaning from texts. The importance of literacy is highlighted by the fact that in the United States, large portions of instructional time are spent in the early grades (especially kindergarten and first grade) teaching children to become competent readers. It is natural that this should be the case, as worlds of learning possibilities are opened to the child who can read.

A parallel milestone that occurs even earlier but that is equally, if not more, important for academic success is the development of oral language ability. It is difficult to conceive of a way in which a child can be successful in formal education without knowing *some* language. However, language is not only important for education; it is central to it and virtually inseparable from it. Without language (be it oral, written, or sign), the potential for learning is greatly reduced, for, in the words of Bruner (1986), "Language not only transmits, it creates or constitutes knowledge or 'reality'" (p. 132).

Given the significance of both written and oral language to educational success, understanding the connection between the two is vitally important for research. The fact that there is a connection between the two is clear, as both are part of the same general language system. Still, as others have noted, it would be a mistake to assume that written language is "just oral language written down" (Snow & Tabors, 1993b, p. 6), or that literacy development is simply "oral language development writ large" (Purcell-Gates, 2001, p. 8). However, it is precisely because of the differences between oral and written language development that understanding the connection between the two is so important. Language

development is a major part of the overall cognitive development of young children, and understanding its connections to literacy can help parents and early childhood caregivers know how to foster language interactions in ways that will benefit the children's concurrent and later literacy development.

For many years, research has examined the connection between oral language and literacy (e.g., Dickinson & Tabors, 2001; Horowitz, 2015; Olson, 1977; Snow, 1983; Wells, 2009; Whitehurst & Lonigan, 1998). The development of these two sets of skills is interrelated (Benson, 2009; Kamhi & Catts, 2005) and has its beginning long before children enter into their formal years of schooling (Snow, Burns, & Griffin, 1998). Studies that have attempted to describe this relationship can be grouped into two lines of research that correspond (though not always purposefully) with two distinct theories of language acquisition and development. Studies that measure aspects of the child's language ability as the independent variables in the analysis are better positioned to draw conclusions that would align with a nativist theory of language acquisition. Born out of the work of Noam Chomsky (1965), nativist theories of language acquisition propose that infants are born with linguistic knowledge structures that facilitate and foster language development. From this perspective, language acquisition depends more on the child's innate ability than on external factors.

Another theory of language acquisition, social interactionism, emerged out of criticism of nativist thinking. Aligning closely with Vygotsky's sociocultural theory (Vygotsky, 1978), social interactionists argued for the need to pay more attention to external factors, as development can never be truly separated from the environment in which it occurs. For these theorists, social interaction, especially with more knowledgeable others, is key to children's language development. Thus, studies aligning with interactionist

theories tend to measure language input from caregivers—instead of the child's language ability—as their primary variable of interest.

Both types of studies (i.e., those measuring children's language and those measuring caregiver language) have found substantial evidence for the influence of language on later literacy development. For example, it has long been known that children with language delays are at risk for later reading difficulties (Silva, Williams, & McGee, 1987), and numerous studies have shown that the kind of talk adults use during shared book reading correlates with various literacy-related skills (Hindman & Skibbe, 2014; Sénéchal, 1997; Son & Tineo, 2016; Zucker, Cabell, Justice, Pentimonti, & Kaderavek, 2013). A distinction is drawn, however, in terms of the extent to which each theory can explain the reasons behind the language-to-literacy connection. A nativist theory, though having some grounds on which to explain language acquisition given that full acquisition appears to happen similarly for all children (in the absence of language disorders), falls short of being able to explain how children learn to read because, far from being universal, mastery of written language does not just happen on its own. Social interactionism, on the other hand, *can* make claims relevant to both the oral and written realms of languages. Indeed, one theory of reading that developed concurrently with, yet independent from, social interactionism is the transactional theory of reading (Rosenblatt, 1969). The theory shares many similarities with social interactionism, as it views the act of reading as a transaction that occurs between the text and reader, a two-way process. Although Rosenblatt explicitly distanced her idea of *transaction* from equation with the term *interaction* (Rosenblatt, 1985), both theories have at their core the idea that meaning is not simply extracted nor constructed, but *co-constructed*.

It is on this co-constructive nature of meaning that my study was hinged. I took as my theoretical starting point Vygotsky's sociocultural theory, in which each function in a child's development is viewed as "appear[ing] twice, or on two planes. First it appears on the social plane, and then on the psychological plane. First it appears between people as an interpsychological category, and then within the child as an intrapsychological category" (Vygotsky, 1981, p. 163). In this view, efforts to understand a child's psychological functioning or development are misguided if they view that functioning or development to be something that happens solely within the child. Rather, one must also consider the socio-psychological processes that occur externally to and in conjunction with the child. The implication this has for language use and development is that whatever sense a child makes of an utterance, the child does not make it alone. The sociocultural context in which the child is situated will always shape and even define what meaning the child makes and how he or she makes it because the child will always be co-constructing that meaning socially or interpsychologically first, before the meaning is internalized by the child.

This divergence from the cognitive, individualistic approach of, what was at the time, the mainstream theories of both developmental psychology and language acquisition is what social interaction theorists (e.g., Bruner, 1983; Nelson, 1985; Snow, 1977) had in mind when advancing their ideas. It is important to note that social interaction theory is not simply a theory of language input. That is, it does *not* presuppose that one can gauge, measure, or predict a child's language acquisition by simply looking at the quality and quantity of language input to which a child is exposed. Rather, as Snow (1977) emphasized, language acquisition is the result of an interactive process in which "the child makes as important a contribution as the mother" (p. 31). Thus, children themselves play an active role in what Bruner (1983) called the Language Acquisition Support System, a term used

to describe the various formats and scripts that quickly become familiar to children as they regularly experience routinized language interactions.

As social interactionist research flourished in the 1970s and 80s, more scholars began considering connections between early language experiences and literacy acquisition. Thus began many studies of the type mentioned previously, where aspects of caregivers' language were measured as the independent variables in analyses designed to examine potential relationships with children's literacy development. It is here that I wish to point out an important inconsistency between theory and empirical research, of which it was the purpose of the current study to address. As mentioned above, a principal idea underlying social interactionism—and more broadly, sociocultural theory—is the commensurate roles of the child and the adult in creating the social context that shapes the interpsychological development of the child. By and large, however, quantitative studies seeking to describe connections between social language interaction and children's literacy development have, ironically, only measured one side of that interaction. It is not that researchers have ignored or failed to account for children's language in their analyses. Rather, by assessing child and caregiver language as variables separate from one another, quantitative research in this field has effectively taken the co-constructive nature of knowledge for granted rather than examined it explicitly in analyses. For example, many studies regress language and literacy outcomes (e.g., vocabulary, phonological awareness, reading fluency) on the quality and quantity of language a child hears at home. Whereas this approach does allow researchers to investigate potential environmental influences on children's language and literacy outcomes, it fails to measure the interaction that occurs socially between the child and caregiver(s). Measuring that interaction is critical for any study conceptualized within a sociocultural framework because failing to do so is failing

to account for the co-constructed meaning that is central to sociocultural theory. This point was elaborated on by Wertsch (1991), who, through integrating Bakhtinian notions of utterance (Bakhtin, 1986), explicated how the higher mental functioning of Vygotsky's theory is inherently situated in and perpetually bound to sociocultural contexts. Wertsch (1991) emphasized the importance of remaining true to the situatedness of the tools and signs (such as language) that mediate mental functioning, by stating that "instead of defining mediational means in terms of linguistic units abstracted away from voices and communicative contexts, researchers should define these means in terms of phenomena that are by their very nature socioculturally situated" (p. 96). Accordingly, I argue that to make legitimate claims about the connection between social interactions and language and literacy outcomes, one must do more than summarize linguistic information within individuals (e.g., calculate proportions or summations of adult speech separately from child speech) and instead measure the co-constructed product of the conversation, the interaction itself. It may be necessary to note that the meaning of the term *interaction*, as it is used here, is distinct from that implied in statistical applications of the word. In a statistical sense, *interaction* is used to describe the phenomenon that occurs when the relationship between an explanatory variable and the outcome is moderated by a third variable. In contrast, the interaction I am referring to here is a variable in and of itself, and thus cannot be captured by simply including an interaction term in the analysis.

The question, then, is, how to go about measuring the interaction? The purpose of this study was to answer this question by investigating the viability of one approach to measuring language interaction within an analysis designed to examine the relationship between early language interactions and later literacy outcomes. Specifically, I proposed that *intersubjectivity*, a construct used extensively in language acquisition research, could

be operationalized in such a way that aspects of language interaction could be measured directly. As I will explain in greater detail later, these aspects of language interaction are essentially indications of the quality and complexity of the meaning that has been co-constructed by adult and child.

To test the viability of this approach, I reanalyzed data from a well-known longitudinal study, the Home-School Study of Language and Literacy Development (HSLLD; Dickinson & Tabors, 2001), that was conducted primarily by researchers at Harvard University (scholars at other universities collaborated), and took place in the late 1980s and the 1990s. The principal purpose of this study was to examine social influences of literacy success. Investigators collected yearly language samples between mothers and their children when the children were three, four, and five years of age. Outcome measures of language and literacy skills were recorded when the children were in kindergarten and then again in first grade. Scores from these assessments were regressed on variables (e.g., proportions of distinct types of talk, mean length of utterance, etc.) calculated from the earlier language samples. The results cover a wide range of subtopics and were published across a span of several years (Beals, 1993, 1997; Beals & De Temple, 1993; Beals, De Temple, & Dickinson, 1994; Beals & Snow, 1994; Beals & Tabors, 1995; De Temple & Beals, 1991; De Temple & Tabors, 1995; Dickinson & Tabors, 2001; M. W. Smith & Dickinson, 1994; Snow, 1991, 1993a, 1993b; Snow & Dickinson, 1990; Snow & Tabors, 1993a; Snow, Tabors, Nicholson, & Kurland, 1995; Weizman & Snow, 2001).

For my study, I saw the HSLLD and its data as well suited for my investigation for several reasons. First, the authors took an explicit social interactionist stance toward language and literacy development, and each language interaction variable was a measure of either child or caregiver talk, but not both. This allowed me to make some comparisons

between my results and those of the HSLLD, which helped me interpret the validity of my claim regarding the importance of measuring language interactions rather than language input or production. Second, the data were collected longitudinally and therefore more suited to be interpreted in terms of developmental aspects of language and literacy than would cross-sectional data. Third, language samples were collected across multiple contexts (e.g., mealtime, toy play, book reading, etc.), which helps strengthen assumptions that the language samples represented the mothers' and children's typical speech. Finally, the language transcripts include metadata information (e.g., time of day, location in home, presence of other siblings, etc.), which can help overcome some of the challenges of working with archival data and allowed me to check and control for confounding factors. I will explain the HSLLD in greater detail in the method section of this proposal.

Chapter 2: Literature Review

In this chapter, I review the literature that has examined the connection between language and literacy development. I begin by defining these two sets of skills and offering a brief overview of their respective developmental beginnings. I then review, in two parts, the research that has examined the role that oral language plays in literacy development. First, I give an account of studies that are more aligned with nativist theories of language acquisition in that they have taken some aspect of child language ability as the primary variable of interest. Next, I describe those studies that followed a social interactionist perspective and attempted to account for social influences on language. I should note that dichotomizing the field in this way constitutes an oversimplification of the wide range of theoretical frameworks employed by these studies. Thus, I wish to make clear that I do not mean to imply that the researchers conducting these studies necessarily held beliefs of language acquisition that fit purely into either category, nor do I mean to assume that the studies make any direct or indirect claims regarding the nature of language development. Rather, I use this categorization as a convenient way of distinguishing on theoretical grounds those studies that attempt to account for environmental influences on language and those that effectively ignore them. The point is to situate the extant research within these broad theoretical frameworks so as to provide a bird's eye view, so to speak, of how the new approach I propose can be understood in relation to this vast and widely distributed body of research. Accordingly, I then conclude this chapter by reviewing the research on intersubjectivity and explaining its hypothesized relationship with children's later literacy measures.

ORAL AND WRITTEN LANGUAGE

Oral language ability concerns children's capacity to understand and produce spoken language. This encompasses a wide range of skills as both receptive and expressive language involves the coalescence of semantic, syntactic, and pragmatic knowledge. Each one of these knowledge subdomains represents a different way in which meaning is embedded in linguistic structure. *Semantics* is concerned with the meaning that is inherent in words, phrases, and sentences. *Syntax* as a domain is the study of the ways in which meaning is influenced by grammatical rules and how sentences are structured. Finally, *pragmatics* deals with the ways in which context contributes to meaning. Language acquisition, therefore, occurs as children develop knowledge (implicitly) in these areas. Some of the first indications of semantic knowledge growth occur around the age of one year when children typically begin uttering their first words. Over the next two years, language develops rapidly as children develop mastery of syntactic rules and begin piecing together words and phrases to form sentences. All along the way, children's pragmatic knowledge grows, as children learn to infer meaning not just from the language itself, but also from the many contextual cues in which the language is spoken. At about three years of age, children typically have mastered the understanding and use of many linguistic structures.

Generally, competence in *written language*, often referred to as literacy or literacy skills, refers to the ability to read and write. However, in my study, mentions of written language or literacy are made with specific reference to the ability to read. Like oral language, understanding written texts requires the use of many component skills, including semantics, syntax, and pragmatics. Additionally, however, reading involves other skills

that are related more specifically to constructing meaning from texts, such as knowledge of the alphabet and letter-sound correspondence. Many developmental milestones that aid children on their way to literacy acquisition occur during the preschool years or even earlier. The following, summarized largely from Snow et al. (1998), is a brief overview of these pre-literacy accomplishments for typically developing children.

By three years of age, most children have developed many print awareness skills related to reading. They understand that books are handled in particular ways, and know the right way to hold a book and turn its pages. They may often mimic the book-sharing routines that they have established with caregivers and pretend to read books by themselves. They recognize certain books by the cover and may comment on the story or characters in books. Over the course of the next year and by the time they are four, children typically begin recognizing and naming individual alphabet letters. They come to recognize print for what it is and understand that it is what is read in books. They learn the existence of different text forms (e.g., print in books versus words on signs versus grocery lists) and understand that these have different functions. Children begin attending to phonological aspects of language and enjoy rhyming or repetitive sounds. Their comprehension of stories matures as they often ask questions or make comments about the stories and even begin to make connections between the information in the stories and their own or others' real life experiences.

CHILDREN'S ORAL LANGUAGE SKILLS AND LITERACY DEVELOPMENT

Oral language skills and literacy skills are acquired in very similar ways (Kamhi & Catts, 2005; Snow, 1983). Both the ability to talk and the ability to read require learning and navigating very complex linguistic systems in which meaning is created in and extracted from form (Snow, 1983). Developmental continuity of oral and written language

skills can be charted, as the two sets of skills have been found to be highly correlated (Pazeto, Seabra, & Dias, 2014), and aspects of each coincide with the maturation of particular cognitive faculties (Snow et al., 1998). Research has documented how the respective development of oral and written language skills are interdependent and reciprocal (Cooper, Roth, & Speece, 2002; Dickinson, McCabe, Anastasopoulos, Peisner-Feinberg, & Poe, 2003).

As the acquisition of oral language prior to that of literacy is nearly ubiquitous across all children, oral language serves as a foundation for literacy (Snow & Tabors, 1993b). This is especially true in languages with alphabetic writing systems (like English), where children often learn to read by sounding out phonemes in words they already know how to speak. This process of decoding letter-sound relationships to interpret meaning would be difficult if children did not already have some understanding through spoken language of the meanings of the words they attempt to read. Even as children become skilled decoders, their ability to read fluently to the extent that comprehension is achieved across words and sentences is highly dependent upon their oral language abilities (Snow et al., 1998). That is because the meaning a sentence may carry is not simply a summation of the individual lexical meanings of the words that compose it. Rather, the meaning of a sentence is the product of syntactic, semantic, and pragmatic relationships among the words it comprises. Although proficiency in the comprehension and use of these structural relationships in both spoken and written language benefits from a reciprocal relationship (i.e., one's ability to produce and understand complex sentences that are spoken will aid one's ability to read and write complex sentences, and vice versa), such ability has its genesis in oral language. Some research studies have noted differences between skilled and unskilled readers in their ability to comprehend and produce these structural relationships

in spoken language (Snow et al., 1998). Other studies have noted that children who lack higher level language skills upon school entry are less prepared to meet the demands of a more literate school environment (Benson, 2009) and may experience reading difficulties (Aram, Ekelman, & Nation, 1984; Catts, Fey, Tomblin, & Zhang, 2002).

Evidence of the relationship between oral language and reading has been found as early as infancy. Using logistic regression in a longitudinal study of 240 children, Shapiro et al. (1990) found that both the rate of language development between birth and age 2, and language ability indices at age 2 were predictive of whether children would experience reading delays at 7 ½ years of age. Using composite scores that included expressive and receptive language gradients and indices along with other neurodevelopmental indicators, the researchers were able to classify 2-year-olds as being at-risk or not-at-risk for reading delays with a specificity of .73 and sensitivity of .78. In other words, 73% of children with reading delays at age 7 ½ were correctly classified by the model as being at-risk at age 2, and 78% of children who did not go on to experience reading delays had been correctly classified as being not-at-risk at 2 years of age. This predictive power of early oral language measures is remarkable, especially considering that its classification accuracy for reading delay is comparable to that of popular preschool screening tools that measure literacy-specific skills, such as phonological awareness, to screen for and predict later reading difficulties (e.g., Invernizzi, Cook, & Geller, 2002-2003).

Semantic and syntactic knowledge and skills.

Whereas the study by Shapiro and colleagues looked at general oral language ability, others have sought to tease apart the various types of oral language skills in order to understand how the different subcomponents of oral language may be important for

literacy. Semantics and syntax are perhaps the two structural aspects of language that have been studied the most extensively.

Semantic and syntactic knowledge and skills may be especially relevant for literacy as aspects of both of these language subsystems can serve as cues for extracting meaning from written texts (Roth, Speece, & Cooper, 2002). Children use their semantic knowledge to deduce the meaning of printed words by combining lexical knowledge (vocabulary) and morphological cues (word forms) from the text. Syntactic knowledge enables children to recognize sentence structure and use it to predict the grammatical form and sequencing of words (Roth et al., 2002). Knowledge and ability in both semantics and syntax can be measured in various ways as each represents a set of related skills with differing levels of complexity rather than one single ability.

Walker, Greenwood, Hart, and Carts (1994) studied a group of 32 children, documenting their vocabulary use and mean length of utterance (MLU) monthly from seven months to three years of age. Children's vocabulary was measured as the total number of distinct words spoken by the child whereas MLU represents the overall mean number of morphemes used per utterance. The researchers correlated these measures with later reading scores, measured by a subtest of the Metropolitan Achievement Test (MAT), in kindergarten, and first, second, and third grades. Both language measures had positive, moderate correlations with reading scores across grades (range = .32 to .62), showing the strongest relationship in kindergarten ($r = .62$ for vocabulary, .55 for MLU) and second grade ($r = .63$ for vocabulary, .58 for MLU).

Scarborough (1990) tested for differences between second graders with and without a reading disability by using multivariate analyses of covariance (MANCOVA) on measures taken when the children were 2 ½ years of age. She looked for differences on

three measures of language production (i.e., syntax, phonology, and vocabulary), calculated from language samples drawn from videorecorded mother-child play sessions. Syntax was measured by using principal components factor analysis to create a composite syntactic production score from two relevant measures: mean length of utterance (MLU) and the productive syntax index (IPSyn), which is itself a composite score representing the frequency of occurrence of 60 different syntactic forms composing four categories: noun phrase, verb phrase, question/negation, and sentence structure. Phonological production (pronunciation) ability was measured as the error rate in consonant pronunciation within the first 100 identifiable words in the language sample. Vocabulary was assessed in terms of lexical diversity, that is, the number of distinct lexical types produced within the first 250 identifiable tokens (words). Using IQ as a covariate, only syntactic production significantly differentiated between groups after controlling for the other variables.

Roth et al. (2002) tested the predictability of children's semantic and syntactic knowledge in kindergarten on reading outcomes in first and second grade. Semantic knowledge was assessed primarily at the lexical level through measures of receptive vocabulary (Peabody Picture Vocabulary Test-Revised, PPVT-R), word definitions (the Oral Vocabulary subtest of the Test of Language and Development-Primary:2, TOLD-P:2), and word retrieval (Boston Naming Test). Syntactic knowledge was assessed through two measures that combined syntax with receptive morphology (Test of Auditory Comprehension of Language-Revised, TACL-R) and expressive morphology (the Formulated Sentences subtest of the Clinical Evaluation of Language Fundamentals-Revised, CELF-R). All measures from kindergarten of both semantic and syntactic knowledge were moderately to strongly correlated with print awareness, decoding, and reading comprehension skills in first and second grade. Although some semantic and

syntactic variables were significant predictors for the three literacy outcomes in linear regression models at first and second grade, these language variables ceased to be significant predictors of print awareness and decoding when phonological awareness was added to the model. However, two of the semantic knowledge variables (i.e., word definitions and word retrieval) were more powerful predictors of the third literacy outcome, reading comprehension, than was phonological awareness at both first and second grades.

Roth et al. (2002) highlighted the importance of this finding by noting that word definitions reflect a higher level semantic skill because defining words requires one to reflect on the lexicon and to "state explicitly what is known implicitly" (p. 268; see also Watson, 1985). Snow et al. (1995) examined word definitions in a different way by coding for the quality of superordinate and relative clauses within children's formal definitions. They found that the quality of children's formal definitions was correlated with children's emergent literacy scores as measured by the Comprehensive Assessment Program (CAP; Mason & Steward, 1989), a measure of knowledge of aspects of environmental print in and out of context, story and print concepts, upper and lower case letter names, beginning and ending word sound awareness, and writing.

Despite the evidence of the connection between oral language and literacy, there has been much debate regarding the role of language in literacy instruction. In what has become known as "the reading wars," proponents of two opposing approaches (i.e., phonics-based instruction vs whole language instruction) have argued for decades as to which is the better method for teaching children to read. *Phonics* is a code-based method because it emphasizes letter-sound correspondences and rules about written language. In contrast, *whole language* instruction emphasizes teaching children to read from words and patterns they frequently hear in oral language.

The debate between these approaches reached its peak in the 1990s, and with the publication of the National Reading Panel (2000) report, which synthesized empirical research and seemed to favor phonics instruction, proponents of the phonics approach were claiming victory. A year later, Congress passed the No Child Left Behind Act that included the Reading First program, a funding provision that required schools to show evidence of their use of scientifically-based reading research. In the years since, the vast majority of curricula and pedagogical approaches in kindergarten, first, and second grade has focused heavily on teaching phonics and other code-based skills. Indeed, this trend is supported by a substantial amount of research that has demonstrated the effectiveness of such approaches (Blachman, Ball, Black, & Tangel, 1994; Fielding-Barnsley & Hay, 2012; Hecht & Close, 2002; Kjeldsen, Niemi, & Olofsson, 2003; Lennon & Slesinski, 1999; Lundberg, Frost, & Peterson, 1988; Lyster, 2002; Martinussen, Kirby, & Das, 1998; Solity, Deavers, Kerfoot, Krane, & Cannon, 1999; Speece, Ritchey, Cooper, Roth, & Schatschneider, 2004; van Daal & Reitsma, 2000). In contrast, the whole language approach to reading instruction has largely fallen out of practice.

Before continuing, I wish to draw an important distinction between the theory and aims of my study and the whole language approach and related practices in reading instruction. I do not seek to make any claims regarding literacy instruction in the primary grades. Instead, I am more concerned with the early psychosocial development that occurs before the formal years of schooling. Although I intended to make connections to aspects of literacy success in the early school years, I did so independent of whatever method of formal literacy instruction may or may not be employed. In other words, the argument that I was making is that there is a fundamental connection between oral and written language learning and skill, and matters of formal literacy instruction constitute an entirely different

question altogether, of which a full evaluation is beyond the scope of the current study. However, as it is reasonable to assume that type of instruction could moderate the relationship between oral language and literacy, future research that examines any such moderating effects is warranted.

That said, there still remains a considerable amount of research that has *not* sought to prove one instructional method better than another, but has instead attempted to answer a more fundamental question—one that is more relevant to the current study—namely, whether and to what extent oral language skills have any relevance for literacy development beyond that of code-based skills (e.g., alphabet knowledge, phonemic awareness), skills that many argue are more proximal to literacy acquisition. When testing the degree of influence of oral language in combination with code-based skills, several scholars have noted that the connection between oral language and literacy is very weak or even nonexistent during the first few years of schooling (Evans, Shaw, & Bell, 2000; Sénéchal & LeFervre, 2002; Speece et al., 2004; Storch & Whitehurst, 2002). Interestingly, however, oral language returns as a strong predictor of literacy in the later elementary grades (Storch & Whitehurst, 2002). One possible explanation for this phenomenon may be that the oral language abilities of all students (whether high or low in oral language skills) are sufficient for understanding the very simple texts that children encounter when learning to read in the earliest grades (Speece et al., 2004).

In an attempt to make sense of the complex and seemingly intertwined influence of oral language and emergent literacy skills on reading achievement, some scholars have proposed literacy development models that incorporate both domains, distinguishing between code-related and language-related knowledge and skills. Whitehurst and Lonigan (1998) distinguished between inside-out and outside-in skills. *Inside-out skills* constitute

the child's knowledge of the rules for reading and writing, such as knowledge of graphemes (letter names) and phonological awareness. *Outside-in skills* represent the child's ability to understand the context of what they are reading or attempting to read. The skills include various semantic, syntactic, and pragmatic language abilities.

Paris (2005) distinguished between constrained and unconstrained skills. He noted that reading fluency and the code-based skills of alphabet knowledge and phonemic awareness are highly constrained in ways that have conceptual, developmental, and methodological implications, and that skills related to vocabulary and comprehension are far less constrained. For example, alphabet knowledge is a constrained skill because learning the names of all the English letters and their corresponding sounds is something that can occur relatively quickly and for which there is a ceiling. That is, once a child knows the alphabet, there is no more to learn in terms of alphabet knowledge. Thus, mastery in such skills can be achieved completely and very early on. By contrast, reading comprehension is a skill for which there is no clear ceiling and one in which children continue to improve for many years.

Both of these models of literacy development have important implications for the role of language in literacy development. Whitehurst and Lonigan's (1998) dichotomy highlights the importance of focusing on children's language development (outside-in skills) during the preschool years and earlier. When children are very young, they are not yet ready for the direct instruction that is often used to teach the code-based, inside-out skills. However, parents and preschool teachers can still foster children's development of literacy precursors by supporting their oral language development. Paris' (2005) distinction between constrained and unconstrained skills underlines the importance of certain language skills for the long term. Although important for early reading, the constrained

nature of code-based skills helps makes clear the fact that becoming a skilled reader involves much more than simply becoming a skilled decoder. Paris further pointed out that it is easier to alter children's rate of development of constrained skills than unconstrained skills because the latter take more time to develop. This may help explain why comparatively larger effect sizes are often found in tightly-controlled experimental studies for code-based skills than for language-based skills. Thus, Paris advocated for the inclusion of unconstrained skills in pedagogical practice in addition to constrained skills, a position that has been echoed by other researchers (Bingham & Patton-Terry, 2013).

Both models also illuminate some important methodological challenges that should be considered. Whitehurst and Lonigan (1998) noted that these various precursors to literacy are best understood when considered as interacting components of not one global literacy ability but a complex matrix of interrelated abilities. Thus, caution should be taken in analyses so that quests for parsimony do not result in the oversimplification of complex processes (Roth et al., 2002). Furthermore, Paris (2005) was careful to point out the methodological problems of lumping constrained and unconstrained skills, with their diverging psychometric implications, into a single analysis.

These challenges highlight the obstacles that must be confronted when viewing literacy within a skills-based model. Van Sluys, Laman, Legan, and Lewison (2005) noted the distinction between skills and transactional models of reading[1]. (Note that these two perspectives represent broader approaches than I have thus far considered in that they are

[1] Van Sluys et al. (2005) also distinguish a third model of literacy, *critical literacy*, which is the focus of their article. However, this third orientation to reading, while important in its own right, is less relevant to the current study in that it extends its focus beyond *how* meaning is constructed from texts. Instead, critical literacy positions texts within larger sociopolitical systems with the aim of considering its ethical implications.

concerned with the act of reading or engaging in literacy practice *generally*, rather than the process of learning to read or developing literacy.) A skills model of reading assumes that meaning is extracted from texts starting from the bottom up. The reader decodes letters into sounds, sounds into words, words into sentences, and from there, derives meaning from the text. A transactional model views reading as a process between the reader (with his/her accompanying prior knowledge and experiences), the written text, and the context in which the reading occurs. In this view, meaning is not something inherent in the text to be extracted by the reader, but rather something that "happens" between the reader's background knowledge and the text (Rosenblatt, 1985, p. 98).

Most approaches to literacy development focus heavily on the skills needed for acquisition. This is not without good reason, as it may be difficult to explain fully how children learn to read without paying significant attention to skills such as knowledge of print and phonemic awareness. However, as noted above, a bottom up approach that focuses heavily on discrete skills can be problematic when the goal is to determine the relationship between oral language and literacy. Therefore, I argue that beginning with a social interactionist framework—or, more broadly, a sociocultural framework—is a more suitable approach, as this perspective aligns more closely with transactional theories of literacy.

SOCIAL INFLUENCES ON LANGUAGE AND LITERACY DEVELOPMENT

Researchers operating within sociocultural theoretical frameworks have investigated the relationship between oral language and literacy by attempting to account for social or environmental influences. The range of social and environmental aspects that have been identified in such studies are myriad. Researchers have examined different types of context in which language interaction occurs, including peer-to-peer play (Pellegrini &

Galda, 1990, 1991), parent-to-child play (Cristofaro & Tamis-LeMonda, 2012; Katz, 2001), and teacher-facilitated play activities (Girolametto, Weitzman, & Greenberg, 2004; Massey, 2013; Schrader, 1990), preschool classroom talk (Dickinson & Porche, 2011), and shared book reading (DeTemple, 2001; Mascareño, Snow, Deunk, & Bosker, 2016; Sparks & Reese, 2012). Scholars have also considered different types of child and caregiver talk, including the following, somewhat overlapping categories: decontextualized language (Beals, 2001; Curenton, Craig, & Flanigan, 2008; Rowe, 2013; Snow, 1983, 1993b), literate language (Benson, 2009; Curenton & Justice, 2004; Westby, 1991), narrative language (Rowe, 2012; Snow & Dickinson, 1990), rare or sophisticated vocabulary (Beals & Tabors, 1995; Weizman & Snow, 2001), explanations (Beals & Snow, 1994), and elaborations (Sparks & Reese, 2012). Because of the immense volume and breadth of this research is not feasible to provide a review of all the studies in these categories, nor is it necessarily advantageous to do so. However, one type of talk, decontextualized language, is particularly relevant to the current proposal, and I will give, immediately below, a short description of what it is and how it has been studied.

Decontextualized language

Decontextualized language is talk concerned with "the world beyond the here and now" (Snow et al., 1995, p. 38), and may refer to objects not currently present, past or future events, hypothetical situations, or abstract ideas (Curenton & Justice, 2004; Marvin & Cline, 2009; Rowe, 2012). This contrasts with contextualized language, which concerns talk that focuses on the situation at hand or on objects located within the immediate context of the speakers (Curenton et al., 2008). In terms of language acquisition, children develop the ability to understand and speak contextualized language before they acquire decontextualized language (Snow, 1983).

The distinction between contextualized and decontextualized language is important because for each type of discourse, a listener must attend to different types of cues in order to construct meaning from what is being said. Contextualized speech has the advantage of using information external to the utterance itself yet readily available to the listener, such as gestures or environmental cues (Curenton et al., 2008). For example, a child listening to his mother talk about an enormous dog bounding before them across the yard has the advantage of seeing the object referred to in real time, as well as his mother's facial expressions and hand gestures, in which she may be pointing to the dog or signaling its size by spreading her hands apart. Thus, even if the child does not understand the meaning of the words *dog*, *very*, or *big*, he still has a good chance of understanding the message his mother is attempting to convey by actually seeing the dog and observing his mother point to the dog and make a gesture to indicate great size.

By contrast, decontextualized language is that which relies on linguistic cues, such as grammar and vocabulary, to communicate meaning (Curenton & Justice, 2004; Rowe, 2013). A mother telling her child about the large dog she saw earlier that day might or might not choose to use gestures to indicate its size. In either case, the child would have to rely solely on linguistic information to understand the message. For example, to understand the utterance, *I saw a very big dog*, the child needs lexical knowledge (i.e., know the meaning of the individual words of the sentence), syntactic knowledge (i.e., understand that, because *saw* is spoken after *I* but before *dog,* it is the mother who is seeing the dog and not the other way around), morphological knowledge (i.e., that *saw* means it happened at some point in the past), grammatical knowledge (i.e., that the adverb, *very*, is modifying the adjective, *big*, which is modifying the noun, *dog*). In addition to its greater linguistic complexity, decontextualized language requires and promotes higher order cognitive

processes, such as reminiscing and planning (Curenton et al., 2008) and sequencing and causality (Rowe, 2013).

Much of everyday, spoken conversation is heavily contextualized. In contrast, because it is language displaced in space and time (Olson, 2006), written texts are inherently decontextualized. For this reason, scholars have argued that decontextualized oral language skills are especially relevant for literacy development (Peterson & McCabe, 1994; Snow, 1983, 1991; Wallach & Miller, 1988). Some empirical studies have found a positive relationship between both parents' and children's oral decontextualized language use and one or more of the children's later literacy outcomes (e.g., Beals, 2001; Peterson & McCabe, 1994; Rowe, 2013). For example, Snow, Cancino, Gonzalez, and Shriberg (1989) found strong correlations between children's decontextualized language skills and later spelling and reading performance. Rowe (2012, 2013) reported that parents' use of decontextualized talk is positively related to children's vocabulary growth over time. An important implication of this research is that it shows how skills relevant to literacy acquisition can be developed through oral language in the early years, well before children are introduced to formal literacy instruction. Moreover, this development can be fostered by parents and caregivers in developmentally appropriate ways through explanations, narratives, or engaging in fantasy play (Snow, 1991).

Even as research has provided evidence for social contributions to children's language and literacy development, the issue remains that studies investigating these contributions have effectively taken a language input approach, thereby answering different research questions than those we might ask from a sociocultural perspective. In the following sections, I define *intersubjectivity* and describe how it has been used in research to account for young children's oral language development. I then explain how

this construct can be used to investigate the connection between oral language and literacy development in ways that provide information related to the co-construction of meaning between individuals.

INTERSUBJECTIVITY

Most broadly, *intersubjectivity* can be defined as "the sharing of experiential content (e.g., feelings, perceptions, thoughts, and linguistic meanings) among a plurality of subjects" (Zlatev, Racine, Sinha, & Itkonen, 2008, p. 1). The capacity for this sharing of experience begins soon after birth (Trevarthen, 2011) and is considered a prerequisite for social interaction (Susswein & Racine, 2008). In its earliest stages, the capacity for intersubjective engagement is termed *primary intersubjectivity*, defined as an innate awareness that is "specifically receptive to subjective states in other persons" (Trevarthen & Aitken, 2001, p. 4). This intersubjective engagement evolves as the infant becomes aware of the attention of others through the repetitive experience of protoconversations (Wells, 2009). Through routine interactions with caregivers, the infant comes to understand mutual attention, which Wells (2009) described as the idea that "I know that you are attending to me, and you know that I am attending to you, and we both know that we both know that that is so" (p. 40). Around the age of nine months, these patterns of mutual attention are extended to external objects in what has been termed *secondary intersubjectivity* (Trevarthen & Hubley, 1978) or *triadic joint attention* (Sinha & Rodríguez, 2008) and is operationalized as the infant and adult simultaneously attending to the same object while being aware that the other is doing the same. Developmental markers of this capacity include the infant following the eye gaze of the adult to determine the referent object (Kobayashi, 2010; Tomasello, 2001).

Having defined intersubjectivity, I now turn to describing how it functions as a driver of oral language development by serving as both a means of motivation for young children to engage in talk and the mechanism itself whereby children are able to engage in increasingly more complex speech.

Intersubjectivity as motivation

The innate aspect of primary intersubjectivity is important to consider. As human beings, we are born with a predisposition for social interaction (Wells, 1987). Extensive research has documented the existence and nature of this inner propensity in infants (Bråten, 1988; Gratier & Trevarthen, 2008; Stern, Hofer, Haft, & Dore, 1985; Trevarthen, 1979a, 1979b, 1992, 1993, 2001, 2011). The desire for human interaction develops throughout early childhood and is present across the lifespan (Brinck, 2008; Trevarthen, 2009; Trevarthen & Hubley, 1978; Wells, 1987). Young children, notwithstanding the world being entirely new to them and holding the potential for enjoyable discoveries even when alone, have an inherent drive to share their adventures and discoveries with others (Trevarthen, 2009). The way that adults respond to infants and young children's attempts to communicate and share experience can either foster or thwart their motivation to engage in intersubjective experiences. For example, although it is clear that infants favor the affect-laden speech of their mothers, they will withdraw from speech that is overly dramatic or marked with enthusiasm that is forced (Trevarthen, 2009). Young children are more likely to be highly motivated to initiate conversation when their prior attempts to do so were met with adult responses that indicated that they found the topics to be interesting and relevant (Wells, 1985).

Secondary intersubjectivity brings new affordances for the development of children's language skills as the addition of external referents allows the adult and child to

collaborate to construct a shared meaning of a given topic (Wells, 2009). The developmental nature of secondary intersubjectivity (as opposed to the innateness of primary intersubjectivity) is important to consider. The fact that the ability to engage in joint attention effectively is something that occurs over time means that we, as adults, need to adjust our speech so as to match young children's nascent, though burgeoning, intersubjective capability. Of course, much of the way adults need to change their language when speaking to young children is intuitive (Wells, 2009). For example, adults are generally conscious of the relatively limited cognitive capacities of young children, and so they often adjust their language to be more simplistic and thus easier for children to understand. However, what makes for optimal adult-to-child speech is more complex a matter than that. Even in interactions between adults, there is no guarantee of mutual comprehension, and so the likelihood of misunderstanding is even greater for conversations with children who have to rely on a more limited linguistic repertoire in order to convey and negotiate meaning (Wells, 2009). Thus it is important for adults to "try to adopt the child's perspective and, in his or her next contribution to the conversation, to incorporate some aspect of what the child has just said and to extend it or invite the child to do so him- or herself" (Wells, 2009, p. 53).

The benefit of taking a more child-centered approach is that it has the potential to create what Wells (1985) called "satisfying conversations" (p. 405). Such conversations are rewarding in and of themselves and have the effect of empowering children to utilize linguistic resources to control and understand their environment (Wells, 2009). As children feel that conversation is worthwhile and fun, they are motivated to continue to engage in conversation more and more, thus increasing the amount of time they spend using language. Additionally, the kind of language practice they are experiencing is one in which

meaning is negotiated through each partner's contingent responses to what the other has said. Because responses are contingent, they build off of meaning that has already been constructed, extending and elaborating to create new and more complex ideas. Thus the kind of practice children get when habitually engaged in satisfying conversations is of a higher quality in that it is full of meaning and more likely to require more complex utterances. In contrast, conversations are likely to be less rewarding when well-meaning caregivers, concerned with bringing the child's language use into conformity with their own "internal model," continually correct and instruct the child (Wells, 2009, p. 55). Correcting, instructing, or changing the topic too often may not only demotivate the child from initiating conversations with adults, but it also has the tendency to result in the child's contributions to the conversation as consisting of utterances that are far less complex and that carry less meaning (Wells, 2009).

Intersubjectivity as a mechanism

Primary and secondary intersubjectivity also play important roles as mechanisms in young children's oral language development. The functional role of primary intersubjectivity can be explained relatively succinctly by stating that it functions as a facilitating precursor to secondary intersubjectivity in that it supplies the neurobiological capacity for joint attention skills to develop (Mundy & Acra, 2006). Describing the way in which these joint attention skills (secondary intersubjectivity) support oral language development, however, requires a more thorough explanation and is thus the focus of the remainder of this section. In offering this explanation, I will mostly use the term *joint attention* rather than *secondary intersubjectivity*, though the two constructs are virtually equivalent. The only difference is simply that joint attention is secondary intersubjectivity in its operationalized form, its "outward manifestation" (Trautman & Rollins, 2006, p.

449). Thus most of the empirical research on the subject utilizes the term *joint attention* or another synonymous term, *joint engagement*.

In the early stages of its development (before the age of about 9 months), joint attention is achieved as caregivers provide attentional support in ways that allow both the adult and infant to focus on the same object simultaneously (Adamson, Bakeman, & Deckner, 2004; Bakeman & Adamson, 1984). This may occur when the adult successfully calls the infant's attention to the referent object or when the adult references an object to which the infant is already attending. In doing so, the adult effectively attributes meaning to the infant's actions, and, as this occurs over time, the infant comes to see others as independent, intentional agents (Trautman & Rollins, 2006; Vygotsky, 1978). This recognition of others' intentions gives rise to the next stage of joint attention development (at about 9 to 15 months) in which infants begin to check for the adult's focus of attention (Adamson et al., 2004; Trautman & Rollins, 2006). This *coordinated joint attention* (Bakeman & Adamson, 1984) is marked by the infant's ability to follow the eye gaze or pointing of their adult counterpart. In doing so, their ability to sustain attention purposefully on both the adult and the shared object increases (Adamson et al., 2004).

Joint attention, especially when paired with the ability to coordinate attention between people and objects, is crucial for oral language development (Carpenter, Nagell, & Tomasello, 1998; Rollins & Snow, 1998; Tomasello, 2001). The importance for routine social interactions between parents and their children has long been established by researchers (e.g., Ninio & Bruner, 1978). Such routine interactions are common for very young children (i.e., infants and young children often have a fairly consistent schedule of feeding, napping, playing, etc.) and thus provide the child with "a predictable referential context" that helps to make both the mother's and child's language immediately

meaningful (Tomasello & Farrar, 1986, p. 1454). Scholars have argued that the mechanism underlying these exchanges is joint attention as it works in tandem with other pragmatic factors to facilitate language acquisition (Bruner, 1981; Clark, 2014; Tomasello & Farrar, 1986). When infants and young children cue in on an adult's intended referent, they are able to match objects and actions with their lexical labels (Dominey & Dodane, 2004; Kobayashi, 2010).

A substantial amount of research has provided empirical support for the importance of joint attention for language development. Many studies have found positive associations between joint attention and early word learning (Dunham, Dunham, & Curwin, 1993; Farrant & Zubrick, 2011; Morales et al., 2000; C. B. Smith, Adamson, & Bakeman, 1988; Tomasello & Farrar, 1986; Tomasello & Todd, 1983). Tomasello and Todd (1983) videotaped mothers and their 1-year-old children monthly for six months as they played together with a set of toys in their homes. The researchers found a positive relationship between episodes of joint attention and children's lexical knowledge (vocabulary size) at the end of the six months. Morales et al. (2000) measured children's receptive joint attention skills (i.e., the child's responsiveness to adult-initiated joint attention bids) at five different time points beginning when children were 6 months until they were 18 months old. They found that receptive joint attention ability was positively correlated with both receptive and expressive vocabulary measures when children were two years old.

Intersubjectivity and literacy

Especially when viewing literacy from a transactional perspective, many parallels can be drawn between learning to read written text and the way in which intersubjectivity functions as a mechanism for oral language development. Similar to how meaning is co-constructed orally between two conversing individuals, a reader must construct meaning

from the text in order to achieve comprehension. The written text essentially acts in place of the conversational partner, and the reader interacts with the text to co-construct meaning. The idea that this would happen in both oral and written contexts is supported by Vygotsky's (1978) sociocultural theory. The negotiation of meaning that occurs on the interpsychological plane may occur between persons or between a single person and some cultural tool (Salomon & Perkins, 1998), such as a written text. A single reader is likely to construct different meanings from different texts, just as multiple readers may very well construct different meanings from a single text. Thus, the nature of the meaning that is constructed through written language (in terms of its extent and complexity) is dependent upon the same mechanistic features of intersubjective oral exchanges. In other words, just as the nature of the meaning between two conversing individuals depends upon the contributions of each, so does the nature of meaning that is constructed from written text depend on what both the reader and the text bring to the table.

A similar parallel could be drawn between literacy development and the motivational aspects of intersubjectivity. As humans, we have an innate drive for intersubjective experiences. We are especially motivated to engage in these experiences when we construct meaning with our conversational partner in a satisfying or rewarding way. Whitehurst and Lonigan (1998) stated that "[r]eading, even in its earliest stages, is a process that is motivated by the extraction of meaning" (p. 849-850). In this light, it is not unreasonable to assume that the same inner drive that propels young children to engage in oral communication, thus facilitating their oral language development, may also underlie literacy development.

The broad implication of this parallel between oral and written language is that intersubjectivity, with its mechanistic and motivational underpinnings, may be a useful

construct for understanding the connection between oral language and literacy, that is, for understanding the way in which literacy acquisition is supported by one's oral language skills. A major purpose of my study was to test the viability of this idea by examining the relationship between the intersubjective exchanges of parents and their children and the children's later literacy outcomes. This was attempted by identifying and delineating episodes of joint attention and then measuring aspects of the language exchanges within those episodes. The next chapter details how I approached testing these notions.

As implied above, the theoretical key to this connection is the construction of meaning. Because constructing meaning from written language generally involves more complex processes than oral language due to the fact that written language is inherently more decontextualized and generally more linguistically complex and lexically dense than oral language (Benson, 2009; Purcell-Gates, 2001; Snow, 1983), the relationship between oral and written language development—or, in other words, the fact that oral language development is correlated with the acquisition of reading and writing—may have a great deal to do with the extent to which young children engage in oral language interactions that are more complex, both linguistically and in terms of the meaning that is co-constructed. For this reason, I expected that there would be a positive relationship between the extent to which early intersubjective episodes are characterized by more complex meaning construction and children's later reading measures. In testing this hypothesis, this study was designed to answer the following research questions:

1. Does the complexity of early oral language interactions between children and their caregivers predict children's later reading skills?

2. Do different areas or stages of reading development (e.g., emergent literacy, decoding, fluency) exhibit stronger relationships with these early language interactions?

Considering the many facets of written language development, it seemed reasonable to expect that the relationship between intersubjective aspects of oral language and the acquisition of literacy would differ depending on the area of literacy development being measured. The early stages of reading development involve many subsets of emergent literacy skills, including print awareness, alphabet knowledge, and phonemic awareness. From there, most children learn to read by decoding the letter-sound relationships in words. With practice, they build upon this knowledge until they can read full sentences fluently. Each of these areas involve different levels and different kinds of meaning-making. One plausible hypothesis, therefore, is that intersubjectivity in early language experiences would exhibit a stronger positive relationship with the later stages of reading development where the meaning-making is richer and more complex. In this study, I sought to test that hypothesis. The following chapter explains how this investigation was carried out.

Chapter 3: Method

The purpose of this study was to investigate the relationship between young children's (3 to 5 years old) intersubjective oral language experiences with their primary caregivers and their literacy skills in kindergarten and first grade. Multiple regression was used to test the predictability child-caregiver intersubjectivity on children's later reading scores. The data came from an existing corpus of language samples made publicly available through the Child Language Data Exchange System (CHILDES) (MacWhinney, 2000). This corpus originated from the Home-School Study of Language and Literacy Development (HSLLD) (Dickinson & Tabors, 2001), a longitudinal study that was conducted in the Boston area beginning in 1987. The purpose of the HSLLD was to identify and examine precursors to children's literacy development that stemmed from language and literacy interactions in the home. Language samples were collected in the home when children were three, four, and five years old. In addition to the language samples, children's oral language and literacy skills were assessed during the children's first two years of formal schooling (kindergarten and first grade). Below, I first describe the participants, data collection procedures, and literacy measures used in the HSLLD. I then explain how I coded and analyzed the HSLLD data to test my hypothesis regarding the relationship between intersubjectivity in early childhood and children's literacy development.

PARTICIPANTS

The original group of participants was comprised of 83 English-speaking preschool age children and their mothers, of which 74 (38 girls, 36 boys) were still participating at the time when the children began kindergarten. Of the 74 children, approximately 65% were White, 19% were Black, 9% were of Hispanic origin, and 7% were biracial. Of the

74 children, 28 were living with only one parent (in each case, the mother), 40 were living in homes with two adults, and six children lived in a household with three to five adults. In terms of siblings, 18 were only children, 30 had one sibling, 19 had two siblings, and seven had four or five siblings.

None of the mothers in the study had a college degree. Maternal education ranged from as little as six years of school to some college attendance. Approximately 35% did not have a high school diploma. Of those who had graduated from high school, a little less than half (43%) attended some form of post-secondary education. All families were considered to be of low socioeconomic status. Approximately 40% of the families had an annual income of less than $10,000, 30% reported an annual income between $10,000 and $20,000, and 27% reported an annual income over $20,000. Employment was the main source of income for 60% of the families and one family indicated that their main source of income was child support. The remaining 39% reported AFDC funds as their main source of income. AFDC (Aid to Families with Dependent Children) was a federal assistance program that lasted until 1996.

DATA SOURCES

Language samples

A major benefit to using this secondary dataset is that it is comprised of detailed transcripts of language samples that span several years. Due to the labor-intensive nature of creating transcriptions of spoken language, data collection efforts do not always include such extensive transcriptions. Instead, studies of language production often involve observational coding in real time or from video playback. The benefit of using

transcriptions is that it allows for more precise measurements of language use than one would get from observer ratings of audiovisual data.

Researchers visited the families in their homes once per year for three years beginning when the children were three years old. The visits lasted from one to three hours in length, during which the investigators audio recorded the speech between mothers and their children in six different contexts. Samples taken from book reading, elicited report, mealtime, and toy play contexts were done each year, and magnet play and child reading were added during the third annual visit only. In the current study, I excluded all but the toy play context from the analysis. The magnet play and child reading contexts were excluded because data for those contexts do not exist for the first two time points. The other three contexts (book reading, elicited report, and mealtime) were excluded for several reasons. First, given that the analysis involves coding utterances from 74 participants at three different time points, it would not be feasible to include data from all four contexts. The toy play language samples alone contain hundreds of thousands of utterances. Second, the toy play context seemed more suitable for the current study than the other three. During the toy play, mothers were instructed to play with their children has they normally would do. They were then left to themselves to converse however they chose. In this way, relatively little external structure was imposed on the conversations. In contrast, the book reading and elicited report contexts provided much more structure to the conversation. In the book reading, a large portion of the things parents say is constant across participants, as each mother reads the same set of books to her child. In the elicited report context, the kind of talk that is elicited from the child is similar across participants as each child is asked to tell about a recent experience . Although it is possible to account for the ways these contexts impose structure on the conversations, and although the constancy of such

structure can sometimes be useful when analyzing language, the lack of such external structure is vital for the current analysis. Because my goal was to capture variation in the ways that parent-child pairs engaged in intersubjective talk, the book reading and elicited report contexts seemed less suitable for this analysis as both provide a sort of script of what to say and even, to some extent, how to say it.

The meal time context was excluded largely because of missing data. Meal time data were missing at one or more of the three time points for the majority of participants. In contrast, fewer data were missing for the toy play context than any other context, as most participants had toy play language samples for each of the three time points, and no toy play language sample was missing at more than one time point for any given participant.

Toy play

For the toy play, new toys were added to the set of toys each year. During the year one visit, the toys included a toy optiscope (a kaleidoscope-like toy that multiplies an image), telephones, a puzzle, a baby bottle with disappearing milk, a school bus with miniature people, colored blocks, toy cars, and a tea set with spoons and saucers. For year two, a different puzzle was used, and firefighter hats, and other dress-up hats and beads were added to the set. In year three, a different puzzle was used, and realistic toy animals were added. The toy sessions lasted 10-15 minutes on average.

Audio recordings were made of mother-child talk in each context and subsequently transcribed for analysis using the Codes for Human Analysis of Transcripts (CHAT) transcription conventions, and transcripts were made available to the public through the Child Language Data Exchange System (CHILDES; MacWhinney, 2000).

Dependent variables

Outcome measures for the HSLLD were assessed in kindergarten and first grade using the School-Home Early Language and Literacy tests (SHELL) (Snow et al., 1995), a set of assessments designed to measure children's oral language and literacy skills. The oral language measures included tests of narrative production, picture description, definitions, superordinates, oral comprehension, and receptive vocabulary. The literacy measures included a test of emergent literacy skills administered in kindergarten and two tests of reading skills administered in first grade. For the current study, I used children's scores from these three literacy assessments as the dependent variables. The kindergarten assessment of emergent literacy skills was done through a series of emergent literacy subtests of the Early Childhood Diagnostic Instrument: The Comprehensive Assessment Program (CAP; Mason & Steward, 1989). These subtests include Writing, Letter Naming, Story and Print Concepts, Sound Awareness, and Environmental Print. Scores from each of these five subtests were standardized and then summed to form a total score of emergent literacy skills. The first grade literacy measures included the reading subtest of the Wide Range Achievement Test-Revised (WRAT-R; Jastak, Wilkinson, & Jastak, 1984) and the reading fluency subtest of the Gray Oral Reading Test (GORT; Wiederholt & Bryant, 1986). The WRAT-R reading subtest asks children to name 15 letters and read 42 words out of context, whereas the GORT assesses children's oral reading fluency as measured by the rate and accuracy of their oral reading of a passage. Each of these three outcome measures, although not all encompassing of the many facets of learning to read, represent three separate—though related—areas or stages of reading development. The CAP measures children's emerging literacy knowledge and skills that must be present before children can begin to decode words and or read full sentences. The WRAT-R, too, includes

one measure of emergent literacy, letter naming, but also moves beyond pre-literacy skills to measure reading ability at a very basic level by having children read single words. Finally, the GORT is capable of discriminating between ability levels of fully-fledged readers, as it requires children to read complete sentences in full passages. For convenience in referring to these three sets of tests, and to make for clarity in distinguishing between the literacy skills they were designed to assess, I will refer to them as the *emergent literacy* (the kindergarten measures from the CAP), the *beginning reading* (the letter naming and word reading tests from the WRAT-R), and the *reading fluency* (the reading rate and accuracy measure from the GORT) measures, analyses, or models, depending on whether I am referring to the outcomes themselves or to the regression analyses or models in which they served as the dependent variables.

PROCEDURE

The purpose of my study was to examine the relationship between intersubjectivity and later literacy. As mentioned previously, I expected that children's ability to construct meaning from written texts would be related to the extent to which they participated in the co-construction of meaning orally with conversational partners, especially in terms of the complexity of the co-constructed meaning. The following subsections explain how the data were coded and analyzed to that end. I first explain how I inspected the transcripts to determine the parameters of the language samples to be coded and checked for potentially confounding factors. I then describe how the language samples were coded so as to capture the intersubjectivity and meaning co-construction between children and their caregivers. Next, I explain how the independent variables were calculated and created based on the language sample coding. Finally, I detail the steps taken to inspect the quantified data and

conduct preliminary analyses to check for potential outliers or anomalies in the data and to test for violations of the statistical assumptions of linear regression.

Inspecting the language transcripts

The fact that the HSLLD language samples span multiple years helps ensure that the data include the kind of language interactions that the children typically experienced in the early years prior to attending school. Across the three years and 74 participants, language samples were missing for three participants in year one, ten participants in year two, and seven participants in year three. In all, 202 transcripts were available across years and participants. These transcripts were examined with the purpose of establishing parameters within each transcript so that the scores calculated for each parent-child pair would be based on comparable language samples. This involved reviewing the metadata for each transcript to identify any exceptional circumstances in which the language interactions occurred that may have had the potential to confound the data. Metadata were included at the beginning of each transcript and provided information regarding the context in which the language sample was recorded. In addition to standard pieces of information, the metadata section often contained circumstantial information particular to that visit. For example, it included information regarding presence of other individuals (e.g., siblings, grandparents) in addition to the mother and child, as well as information regarding the location within the home in which the task was completed. Metadata were also reviewed in order to limit the transcripts to similar lengths. Doing this helped ensure a "level playing field" so that measures (e.g., counts of utterances) would reflect observed differences between participants rather than differences in recording times. Although the metadata sometimes contained information regarding the length of time passed during the recording session, passage of time was not recorded consistently enough to provide a means by which

to set limits on the length of each transcript. Instead, my analysis of each transcript was restricted to a certain number of utterances. To determine what that number of utterances should be, I calculated the total number of utterances for each transcript and then examined a histogram of those calculations. This allowed me to see at a glance the variation in transcript lengths and determine the maximum number of utterances to use as a cut-off point that would ensure equal lengths for as many transcripts as possible. In examining the histogram, I noticed a sharp rise in the number of utterances per transcript beginning at about the 200 utterance mark. Thus, I chose 200 utterances as the cut-off point because going much higher than that would quickly result in more and more transcripts having a total number of utterances below the maximum cutoff. This resulted in 80% of the 202 transcripts having the maximum number of 200 utterances.

Coding

The primary object of coding was to identify episodes of joint attention by coding sequences of utterances so as to distinguish between talk that occurs within episodes of joint attention from that which occurs without. Each utterance received a code that indicated whether it was part of a joint attention episode or whether it was spoken outside of joint attention and, if part of a joint attention episode, that also indicated the episode into which the utterance was grouped.

Joint attention episodes were defined according to topic and consisted of at least one utterance from both the parent and child. Thus each joint attention episode begins with the utterance that introduces a new topic and continues as long as the topic is sustained by the interlocutors. Naturally, topics often evolve as they are discussed further, resulting in a situation where a topic gradually becomes more and more conceptually distinct until it seems something entirely different from when it began. This could be problematic if

decisions for what constitutes a distinct episode were made solely on a conceptual level, as one can imagine how it could be difficult to determine where one topic ends and another begins. Therefore, in addition to a clear conceptual difference, demarcation of a new topic was also based on the condition that the current utterance was not contingent on any utterance from within the now previous topic. To illustrate this, consider the follow excerpt from the HSLDD data, as presented in Katz (2001), between 3-year-old Casey and his mother.

Casey: We have cars. One there. One there and one there.

Mother: Cars? Oh, wow, I didn't see the cars. Want to play with the cars?

Casey: Yes.

Mother: Here. You like cars, too, huh.

Casey: Yeah. Blue one.

Mother: Blue one. Four cars.

Casey: Green and blue are my favorite colors.

If the only condition that distinguished between topics was one based on conceptual aspects, there could be some ambiguity as to whether the last utterance would be considered the beginning of a new topic, as Casey is still talking about colors but appears to have moved on from talking about car colors to talking about his favorite colors in general. However, because his remark is both contingent on the preceding utterances and, at least to some extent, conceptually related, all utterances from this excerpt would fall within a single topic and thus a single joint attention episode. The idea here is that utterances that build on, extend, modify, or respond to previous utterances should be considered part of the same episode of joint attention.

I recruited three graduate students with experience coding language transcripts to help code the data. Prior to coding, these raters were trained on the rules for identifying episodes of joint attention. The transcripts were divided evenly among the four raters (with me included) so that each rater received approximately the same number of transcripts from each of the three time points. If an utterance was determined to have been spoken outside of a joint attention episode, it received a code of zero. All other utterances were coded numerically according to which joint attention episode it belonged, as the example in Table 1 illustrates.

Table 1. Episode coding example

Speaker	Transcript	Episode
Mother:	Call me on the phone.	1
Child:	Alright.	1
Child:	Hi Mommy.	1
Mother:	Hello.	1
Child:	Hi.	1
Mother:	How are you?	1
Child:	Hi.	1
Mother:	What are you doing?	1
Child:	I'm at the library, I can't come over here right now.	1
Child:	Bye.	1
Mother:	[laughs]	
Child:	Oh! Look at this great car.	2
Mother:	What color is this car?	2
Child:	Red.	2
Child:	Look! People.	3
Mother:	That probably goes with this other thing.	3
Child:	I know what I can do.	4
Mother:	What?	4
Mother:	Oh, it's not a Frisbee.	4
Child:	I know.	4
Child:	But I'm just trying.	4
Child:	I thought it was a Frisbee.	4
Mother:	You thought it was a Frisbee?	4
Mother:	Here's bus.	
Child:	Oh, look at these!	5
Child:	Three tops.	5
Child:	Tops.	5
Mother:	Where do you think they go?	5

To determine interrater reliability, twenty percent of all utterances were coded separately by two raters. When coding, raters must essentially make up to two decisions for each utterance they code. First, they must determine whether an utterance is part of a joint attention episode or not. If it is, they then must decide which episode the utterance belongs to, that is, whether it should be grouped with the preceding utterances, as a new episode along with subsequent utterances, or whether it is part of an earlier episode that

was interrupted and is now being picked back up with the current utterance. Reliability, measured as percent agreement, was thus calculated twice, once for each type of decision. Of all jointly-coded utterances, raters agreed 84% of the time as to whether the utterance was spoken inside or outside of a joint attention episode. This percentage was calculated by simply dividing the number of utterances where raters agreed by the total number of utterances jointly coded. For those utterances for which both raters agreed were spoken within joint attention episodes, percent agreement was calculated for decisions regarding how utterances should be grouped together: for utterances that began a new episode (as coded by either rater), that utterance was coded as "agree" if both raters coded it as the first utterance in an episode, and as "disagree" if only one rater coded it as such. For the remaining utterances, each utterance was coded as "agree" if the most proximal preceding utterance coded as part of the same episode was the same for both raters. If it was not, that utterance was coded as "disagree." This second percent agreement statistic was then calculated by divided the number of utterances coded as "agree" by the total number of utterances that both raters had previously determined to have been spoken in a joint attention episode. Raters agreed 94% of the time in this second measure of interrater reliability.

Independent variables

To assess the quality of intersubjectivity, variables were quantified based on the coding of joint attention episodes. In previous sections, I described the theoretical basis for the connection between intersubjectivity and literacy by noting how intersubjective experiences through oral language can serve both mechanistic and motivational functions of further language development and that these functional roles can be applied to literacy development. Thus, it is important that measuring the quality of intersubjectivity would

effectively distinguish between conversations along both those dimensions. In other words, the coding scheme should be designed to differentiate between joint attention episodes that resulted in the construction of meaning that was less versus more complex as well as those that seemed less versus more rewarding for the child. Fortunately, both dimensions can be captured rather simply by measuring the length of joint attention episodes and the degree to which those episodes are balanced (in terms of the number of utterances spoken) between the two interlocutors. Explanations of both measures and rationales for why they are suitable ways of assessing intersubjectivity along these dimensions are given in the following subsections.

Episode length

The reason that the length of joint attention episodes can stand as a measurement of the complexity of meaning in conversations has to do with the cooperative principle (Grice, 1975). The *cooperative principle* describes the basic underlying assumption individuals make that the person to whom they are speaking will be cooperative in the way the person engages in conversation. It is defined by four conversational maxims that act as implicit rules that all individuals follow when conversing with another. One of these maxims, the maxim of relation or relevance, suggests that contributions to the conversation are expected to be "appropriate to the immediate needs at each stage of the transaction" (Grice, 1975, p. 47). An important implication of this is that to be relevant, one's contribution to the conversation must offer some information that is new (rather than simply repeating what has already been said) but that is connected (topically) to what was just said. Therefore, if the cooperative principle is followed, the longer a topic is sustained, the more elaborated and extended (and thus more complex) it will become, as each new utterance by necessity adds to, extends, modifies, expounds on the topic at hand. Episode

length was measured by counting the number of turns within joint attention episodes and then averaging across episodes to compute a total score. It is important to note that number of turns can be quite distinct from the number of utterance*s*. A *turn* includes all consecutive utterances of a speaker. If each interlocutor only spoke one utterance before the other spoke again, then the number of turns and the number of utterances would be equivalent. However, it is often the case that one individual will make several distinct utterances before the other makes another contribution to the conversation, and so it can make a difference which method is chosen to measure episode length. Because each interlocutor has no way of increasing the number of turns by more than one on his or her own, measuring the number of turns does more to capture the intersubjectivity of the conversation than counts of utterances. For this reason, I chose to measure the length of episodes by counting the number of turns.

Episode balance

Operationally, the balance of joint attention episodes concerns the degree to which speakers contribute equal numbers of utterances to a conversation. An utterance represents a single thought or idea. In the CHILDES database (MacWhinney, 2000), from whence the language samples in the current study were retrieved, transcription practice follows the general rule that when a speaker expresses multiple distinct thoughts in succession (as determined by the linguistic structure of what was spoken), these are transcribed as separate utterances. Therefore, conceptually speaking, balance has to do with the contribution of ideas, and becomes an important part of assessing the nature of intersubjective talk as it concerns the degree to which meaning is co-constructed equally by both conversational partners. Also, imbalance in each speaker's contributions can lead to conversations that are less satisfying or rewarding (Wells, 2009).

Balance can be measured as the proportion of total utterances spoken by either the parent or the child, or as a ratio of parent to child utterances (or child to parent utterances). However, both ways of calculating balance result in a measure of balance that is relative from one interlocutor to the other. To obtain a measure of overall balance where imbalance in either direction (i.e., more parent utterances than child utterances or vice versa) is combined onto a single scale, a further transformation is needed. This can be achieved by taking the absolute value of .5 minus the quotient of child utterances divided by total utterances, as so:

$$| .5 - (\text{Child utterances} \div (\text{Child} + \text{Adult Utterances}) |$$

The result of the above equation is effectively a measure of the magnitude of *imbalance* of child and adult contributions, with higher numbers reflecting greater imbalance in either direction. To make it a measure of *balance* (for convenience purposes in describing its relationship with other variables) the signs for this measure were reversed (changed from positive to negative) prior to analysis so that higher numbers indicated greater degrees of balance and lower numbers indicated greater imbalance.

Covariates

Nonverbal intelligence was added as a covariate to each regression model to control for any influence that general, non-language-based intelligence might have on the outcome. Children had been administered the Test of Nonverbal Intelligence (TONI; Brown, Sherbenou, & Johnsen, 1982) on the same date in which they were assessed on each outcome. Thus, the regression model with emergent literacy as the dependent variable included participants' kindergarten TONI score as a covariate, and the models containing the beginning reading and reading fluency dependent variables included participants' first grade TONI scores as a covariate. In each case, the standard score from the TONI was

used, which has a mean of 100 and a standard deviation of fifteen. A second covariate, gender, was added to each model as a dummy coded variable with a value of 1 indicating female. Lastly, age was included as a covariate only for the reading fluency model. The reason for this was that only the raw scores and grade equivalent scores were available for the GORT in the data. For the other two dependent variables, the CAP and the WRAT, the standard scores, which already take age into account, were available. Thus, child's age at the testing date was included in the model where reading fluency was the outcome.

It may be worth mentioning that the child's language ability was not included as a covariate in the models, despite the fact that quantitative studies looking at language development as social interaction often have included such measures as covariates. These studies typically involve some measure of caregiver language as the primary variable of interest, and so including the child's language ability as a covariate makes sense as it is a separate measure altogether. In this study, however, the child's language ability was a component of the intersubjective measures already serving as predictors in the models. As stated previously, a central purpose of this study stemmed from the fact that social interaction research has yet to quantify the actual language interaction in a way that brings the child's and parent's language together into a single variable. The intersubjective measures described above were designed to capture the product of the parent's and child's language production, which product is theorized to be partially the result of the child's language ability at the time. Thus, a covariate based on the child's language ability would likely absorb a substantial proportion of any variance accounted for by the intersubjective measures and therefore make it more difficult to determine the relationship between these predictors and the outcomes.

To conduct the analysis, each participant's scores that had been calculated from the language coding had to be matched to his or her scores on the literacy assessments. However, distinct sets of values were used to identify participants in the two datasets, requiring that participants be matched on birthdate. This resulted in four participants who could not be matched (two pairs of participants who shared birthdates), leaving a total of 70 participants that were included in the analysis.

Chapter 4: Results

PRELIMINARY ANALYSES

Prior to estimating the regression models, data were inspected for errors and irregularities. All preliminary and primary data analyses were conducted using IBM's SPSS Software Version 24. Descriptive statistics, including means and standard deviations, were calculated (Table 2) and the raw data and histograms of each variable were inspected visually. For each model, the variance inflation factor of each regressor was computed to check for multicollinearity. No evidence of multicollinearity was found as no regressor had a variance inflation factor greater than 1.17 in any of the three models. Regression diagnostic statistics were computed to check for irregular cases. In doing so, I largely followed Darlington and Hayes' (2017) guidelines to take a descriptive, holistic approach in examining cases exhibiting extreme distance, leverage, or influence.

Table 2. Descriptive statistics of independent and dependent variables

	N	Min	Max	Mean	Std. Dev.
Episode Length (avg. turns)	70	3.20	15.68	7.00	2.76
Episode Balance	70	-.36	.00	-.09	.08
Nonverbal IQ (TONI; kinder)	74	67.00	136.00	100.93	19.31
Nonverbal IQ (TONI; 1st)	70	70.00	135.00	96.27	13.04
Emergent Literacy (CAP)	74	-7.11	7.73	.00	4.01
Beginning Reading (WRAT)	65	63	137	98.29	18.123
Reading Fluency (GORT)	68	.00	33.00	9.51	9.16
Valid N (listwise)	58				

Distance

Distance was assessed by examining the t-residuals (referred to as "studentized deleted residuals" in SPSS). Visual inspection of histograms for the t-residuals indicated

no highly irregular cases. All t-residuals fell below an absolute value of 2.5, except for one case in the emergent literacy model whose t-residual was 2.96. However, as it is not uncommon to observe t-residuals this large in sample sizes of over about 30 cases (Darlington & Hayes, 2017), and as this is the only t-residual over 2.5 in a sample of 69 participants, it was determined to be unproblematic.

Leverage

Leverage was assessed by inspecting cases' *hat values* (h_i) for each model. These were computed by adding 1/N to the centered leverage statistic generated by the software. Essentially, a case's h_i indicates the proportion by which that case lowers its own residual by pulling the regression line towards itself. The *h* statistic has a maximum value of 1 and a minimum value of 1/N. Examination of histograms of the h_i statistics showed no highly irregular values. Furthermore, no cases had a h_i statistic above .20 for any of the three models, indicating that all cases generally exhibited low leverage on the regression lines.

Influence

Influence was examined in two ways. Total influence was assessed using Cook's distance, which provides a measure of the degree to which predicted outcome values would change overall if that case were deleted from the model. Partial influence was examined by inspecting the dfbeta statistics. These statistics are computed for each regressor and indicate the quantity that the coefficient for the given regressor changes by including that case in the model. Thus, Cook's distance was used to examine cases' influence on the predicted outcome, and dfbeta statistics were used to assess cases' influence on individual predictors. For the Emergent Literacy Model, histograms of Cook's distance values revealed two cases (both with a Cook's distance of .14) that stood out from the rest.

Although not large from a conventional standpoint, the values for these cases were about twice as large as the value for any other case (the mean of Cook's distance values for all cases was .02 with a standard deviation of .03). Sensitivity analyses were conducted by running the model with and without the potential outliers and comparing the results. No change in statistical significance was observed for the t-tests of the predictors nor in the overall F-test. However, the proportion of variance explained by the model rose by approximately 5 percentage point each time one of the cases was removed and about 9 percentage points when both cases were removed. Inspection of the dfbeta statistics revealed these same two cases to be potentially substantial influencers for two separate regressors. One case had a dfbeta value of 1.9 for the intercept, nearly twice that of any other case, and the other had a dfbeta value of -.11 for the episode length predictor, nearly three times that of the next nearest case (-.04). Despite this irregularity, however, the fact that Cook's distance values and dfbeta values were not extremely large, and given that the sensitivity analysis revealed that these cases did not change the statistical significance of the model or any of the predictors, I decided to retain these cases in the analysis.

For the Beginning Reading regression model, one irregular case was noted, having a Cook's distance value of .12. When this case was removed and the analysis was run again, there appeared to be no significant change in the model results. The statistical significance remained constant and the R^2 statistic remained virtually the same. Examination of the dfbeta values suggested that no case seemed to hold any substantial, undue influence on any of the regressor coefficients.

In examining diagnostic statistics of influence for the Reading Fluency regression model, one case stood apart from the others in terms of its influence on predicted outcome scores (Cook's distance = .15). Once again, a sensitivity analysis was conducted with this

case removed. Results remained largely the same with the statistical significance of the model and each predictor being unchanged and the R^2 statistic increasing only slightly. Assessing the distribution of dfbeta values for this model revealed four cases that seemed to have the potential to be exerting undue influence on the predictor of episode length. The dfbeta values for these cases were -.19, - 18, -17, and .2. Sensitivity analyses were conducted to determine what, if any, impact deleting these cases from the model would have on the results. Although a small change was observed in the regressor coefficient each time one of the four cases was removed, the standard error for that regressor and the statistical significance of that regressor's predictability on the outcome remained unchanged. Nor did statistical significance change when all variables were simultaneously excluded from the analysis. Thus the decision was made to retain all four cases in the analysis.

Linearity and homoscedasticity

The assumption that the relationship between each predictor and outcome is linear was assessed by examining the scatterplots of the residuals against each predictor variable and against the predicted values. A fit line for the mean value of the residuals was added to each scatter plots. For each plot, the mean of the residuals was equal to zero at all possible values of the dependent variables. Loess lines were also added to the same scatterplots. For all plots, the loess lines ran close to the mean value fit line and did not deviate systematically around the line. Thus, no indication of nonlinearity between the predictors and outcomes was found.

These same scatterplots were also inspected for the presence of heteroscedasticity by checking that the variance of the residuals was constant across all values of the predictor and all predicted values. Only one scatterplot, one for the Reading Fluency model,

appeared to show the potential for heteroscedasticity. The dispersion of the data points on this plot appeared in shape to reflect ordinary heteroscedasticity. To test whether heteroscedasticity was present, the variance of the t-residuals (tr^2) was normalized by computing the rank order position in the distribution for each value of tr^2, and then computing the Van der Waerden scores (a type of Z-score) based on those ranks. These normalized scores were then regressed on all the regressors of the Reading Fluency model. The results of this analysis was not statistically significant ($R=.408$, $F=2.28$, $p > .05$), indicating a retention of the assumption of homoscedasticity.

Normally distributed residuals

Histograms of the standardized residuals and Normal Quantile-Quantile plots were inspected for skewness and kurtosis. Standardized residuals seemed to be normally distributed for each of the three dependent variables. Additionally, all points on the Q-Q plots lay fairly close to the 45-degree line (see Figures 1-6).

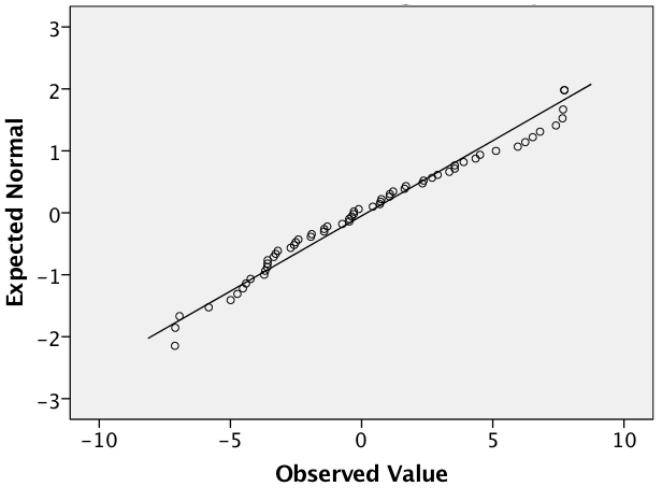

Figure 1. Normal Q-Q plot of emergent literacy scores

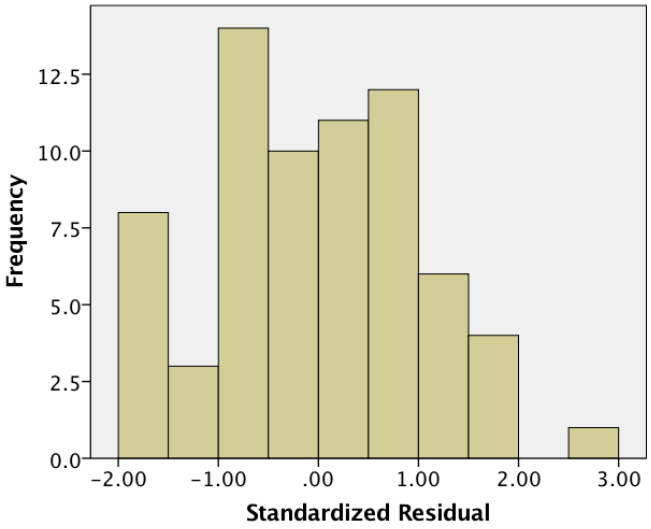

Figure 2. Standardized residuals of emergent literacy scores

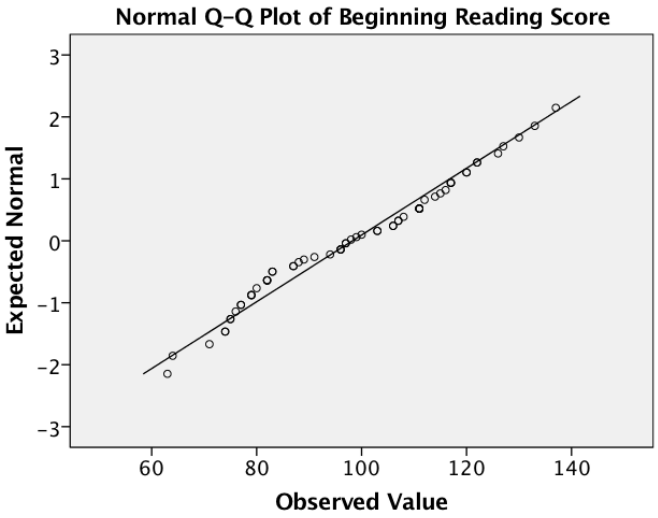

Figure 3. Normal Q-Q plot of beginning reading scores

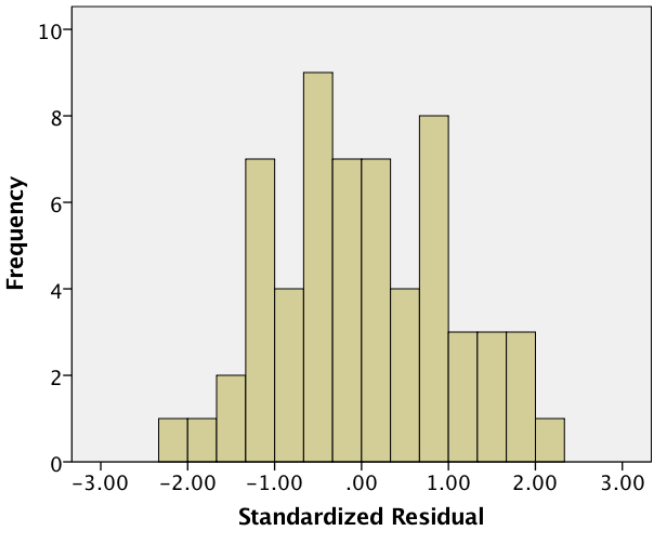

Figure 4. Standardized residuals of beginning reading scores

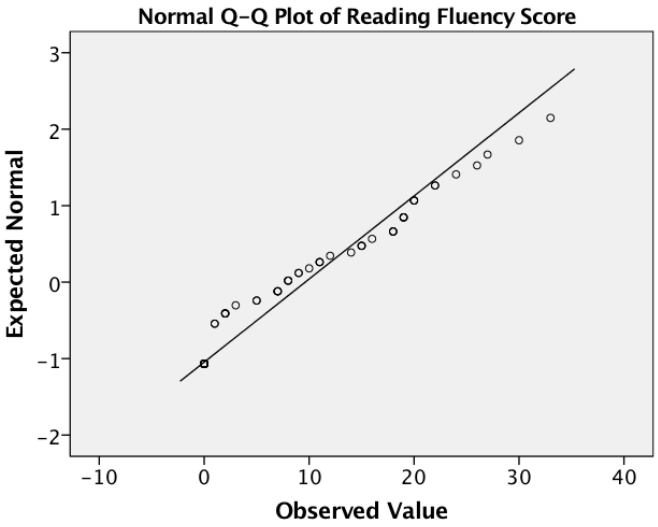

Figure 5. Normal Q-Q plot of reading fluency scores

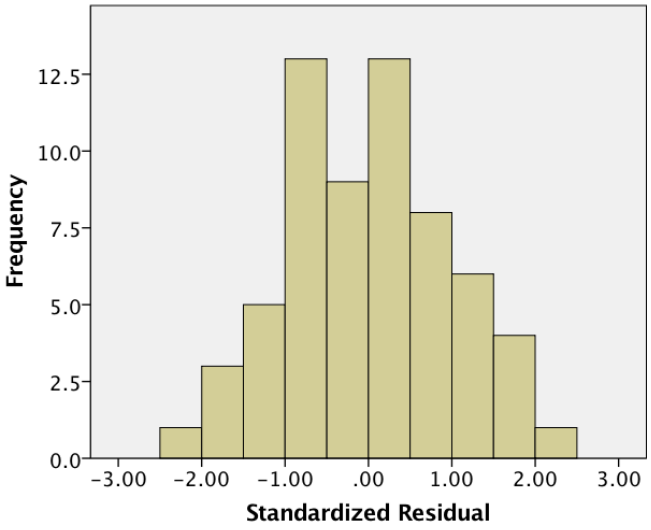

Figure 6. Standardized residuals of reading fluency scores

Independence of residuals

The data were assumed to be independent as no violation was suspected to be possible as a result of clustering or serial dependency. Clustering seemed unlikely because the participants in the sample were recruited individually and all data were collected in the homes of each family. Serial dependency seemed unlikely as the measures that were taken over time were averaged together before being used in analysis.

PRIMARY ANALYSES

Three multiple regression analyses, one for each of the three dependent variables (emergent literacy, beginning reading, and reading fluency), were conducted. Ordinary Least Squares (OLS) regression method was used for each test. The alpha level for these analyses was set at .05. Because multiple tests were to be conducted, a Bonferroni correction was applied by adjusting the alpha level for each test. In determining the adjusted alpha levels, I considered two options. One option was to adjust the alpha level equally among the three tests such that $\alpha = (.05/3)$. Another option was to adjust the alpha level differently according to the theorized relationships. Because my hypotheses predicted that the strength of the relationship between the independent and dependent variables in the population would be stronger for reading fluency, weaker for beginning reading, and weaker still for emergent literacy, I expected to have more statistical power to detect a relationship in reading fluency analysis and the least amount of power to detect a relationship in the emergent literacy analysis. Thus, one approach could be to adjust the alpha level to match anticipated power such that the overall alpha still amounted to .05. For example, I might use $\alpha = .001$, $\alpha = .01$, and $\alpha = .039$, for the reading fluency, beginning reading, and emergent literacy analyses, respectively, so that the latter two analyses would be more adequately powered to detect a relationship. However, in the absence of previous

research providing an empirical basis for determining the amount of power needed to detect each type of relationship, determining different alpha levels seemed too arbitrary a task to be appropriately justified. I therefore determined to divide the alpha levels equally and to set α at .016 for the reading fluency test and α at .017 each for the beginning reading and emergent literacy tests.

Because different scales were used for the various dependent and independent variables, all variables, except for *age*, were converted to z-scores prior to analysis in order to ease interpretability. For each model, the regressors were entered in two separate blocks. The first block consisted of the covariate (nonverbal intelligence) and, in the case of the Reading Fluency model, the child's age on the testing date. The two primary variables of interest, episode length (measured as the average number of turns per joint attention episode) and episode balance (as an indicator of the degree to which caregiver and child contributed an equal number of utterances to the conversation) were entered together in the second block so as to determine what proportion of variance, if any, these variables had on the outcome above and beyond that of the covariate(s).

Emergent literacy

With emergent literacy as the outcome, the model with only the covariates, nonverbal intelligence, and gender included as predictors (Table 3) was statistically significant ($F(2, 66) = 5.80, p < .01$), with an R^2 of .15. The model with episode length and episode balance added as predictors was also statistically significant ($F(4, 64) = 5.01, p < .01$). The R^2 increased from Model 1 to Model 2 by .09 to .24. However, with the adjusted α, this change in R^2 was not statistically significant ($F(2, 64) = 3.73, p = .029$).

Table 3. Results for the emergent literacy regression model

Model		*B*	S. E.	*β*	*t*	*p*	95% CI
1	(Constant)	-.05	.16		-.06	.779	(-.37, .28)
	Nonverbal IQ (kinder)	.40	.12	.38	3.41	.001	(.16, .64)
	Gender	.08	.23	.04	.33	.739	(-.38, .53)
2	(Constant)	-.03	.16		-.17	.862	(-.34, .29)
	Nonverbal IQ (kinder)	.34	.12	.33	2.93	.005	(.11, .58)
	Gender	.03	.22	.01	.12	.903	(-.42, .47)
	Episode length	.25	.11	.24	2.16	.035	(.02, .47)
	Episode balance	.16	.11	.16	1.42	.161	(-.07, .39)

Nonverbal intelligence was a statistically significant predictor in the final model ($t = 2.93$, $p < .01$). Controlling for the other predictors in the model, for every 1 standard deviation increase in nonverbal IQ scores, kindergartners performed .34 standard deviations better on the emergent literacy assessment. Gender was not a statistically significant predictor ($t = .12$, $p = .903$). Using the Bonferroni-corrected α, the length of joint attention episodes was not a statistically significant predictor of children's emergent literacy scores ($t = 2.16$, $p = .035$), and neither was the independent variable of episode balance ($t = 1.42$, $p = .161$).

Beginning reading

For the beginning reading outcome (the WRAT-R letter naming and word reading subtest), the model with only the covariates, nonverbal intelligence, and gender included as predictors (Table 4) was statistically significant ($F(2, 57) = 8.97$, $p < .001$), with an R^2 of .24. When episode length and episode balance were added as predictors, the resulting model was also statistically significant ($F(4, 55) = 7.37$, $p < .001$). The R^2 increased from

Model 1 to Model 2 by .11 to .35. This change in R^2 was statistically significant ($F(2, 55) = 4.62, p = .014$). The *Adjusted* R^2 for the second model was .30.

Table 4. Results for the beginning reading regression model

Model		*B*	S. E.	*β*	*t*	*p*	95% CI
1	(Constant)	-.07	.16		-.49	.627	(-.41, .25)
	Nonverbal IQ (1st gr)	.51	.12	.49	4.24	.000	(.27, .74)
	Gender	.02	.23	.01	.10	.924	(-.44, .49)
2	(Constant)	-.01	.16		-.05	.958	(-.32, .31)
	Nonverbal IQ (1st gr)	.48	.11	.46	4.15	.000	(.25, .71)
	Gender	-.05	.22	-.03	-.25	.807	(-.50, .39)
	Episode length	.34	.12	.31	2.77	.008	(.09, .58)
	Episode balance	.12	.11	.12	1.07	.289	(-.10, .34)

Nonverbal intelligence was a statistically significant predictor in the final model for beginning reading ($t = 4.15, p < .001$). After controlling for episode length and episode balance, for every 1 standard deviation increase in nonverbal IQ scores, first graders performed .48 standard deviations better on the WRAT-R letter-naming and word-reading subtest. Gender was not a statistically significant predictor ($t = -.25, p = .807$). The length of joint attention episodes was a statistically significant predictor of beginning reading scores ($t = 2.77, p < .01$). Controlling for the other predictors in the model, as the average number of turns within parent-child joint attention episodes increases by 1 standard deviation, children's beginning reading scores are expected to increase by .34 standard deviations. The other independent variable, episode balance, was not a statistically significant predictor in the model ($t = 1.07, p = .289$). The increase in R^2 from the first to the second model indicated that episode length and episode balance accounted for about 11% of the variance in children's letter naming and word reading ability above and beyond the variance accounted for by nonverbal intelligence and gender.

To determine the proportion of variance uniquely accounted for by episode length, the analysis was run again, this time with nonverbal intelligence, gender, and episode balance entered in the first block and episode length entered in as a second block. The R^2 for the first model was .26, which then increased to .35 in the second model when episode length was added. This change in R^2 was statistically significant ($F(1, 55) = 7.67, p < .01$), suggesting that episode length accounted for 10% of the total variance in beginning reading scores above and beyond the variance accounted for by all other predictors in the model.

Reading fluency

For reading fluency, the model with only nonverbal intelligence, gender, and age included as independent variables (Table 5) was statistically significant ($F(3, 59) = 4.54, p < .01$), with an R^2 of .19. The model with the two predictor variables added was also statistically significant ($F(5, 57) = 5.73, p < .001$). The R^2 increased from Model 1 to Model 2 by .15 to .34. This change in R^2 was statistically significant ($F(2, 57) = 6.30, p < .01$). The *Adjusted* R^2 for the second model was .28.

Table 5. Results for the reading fluency regression model

Model		*B*	S. E.	β	*t*	*p*	95% CI
1	(Constant)	1.40	1.73		.81	.422	(-2.06, 4.86)
	Nonverbal IQ	.32	.12	.35	2.81	.007	(.09, .55)
	Gender	.28	.22	.15	1.24	.219	(-.17, .73)
	Age	-.23	.25	-.19	-.94	.353	(-.73, .27)
2	(Constant)	.51	1.63		.32	.753	(-2.75, 3.78)
	Nonverbal IQ	.31	.11	.33	2.87	.006	(.09, .52)
	Gender	.22	.21	.12	1.04	.301	(-.20, .64)
	Age	-.10	.24	-.05	-.41	.685	(-.57, .38)
	Episode length	.33	.12	.31	2.78	.007	(.09, .56
	Episode balance	.22	.10	.23	2.11	.039	(.01, .42)

Nonverbal intelligence was a statistically significant predictor in the final model ($t = 2.87, p < .01$). After controlling for age and the two intersubjective predictors, for every 1 standard deviation increase in nonverbal IQ scores, first graders performed .31 standard deviations better on the GORT reading fluency test. Gender was not a statistically significant predictor ($t = 1.04, p = .3019$), nor was age ($t = -.41, p = .685$). As expected, the length of joint attention episodes was a statistically significant predictor of children's reading fluency scores ($t = 2.78, p < .01$). When controlling for all other variables in the model, children performed .33 standard deviations better on the reading fluency test for every 1 standard deviation increase in the average number of turns within parent-child joint attention episodes. Given the Bonferroni-corrected α, episode balance was a not a statistically significant predictor of reading fluency ($t = 2.11, p = .037$). The change in R^2 from Model 1 to Model 2 suggests that episode length and episode balance accounted for approximately 14% of the variance in reading fluency scores above and beyond that accounted for by nonverbal IQ, gender, and age.

As was done with the beginning reading outcome variable, in order to determine the proportion of variance uniquely accounted for by episode length, the analysis was run again, this time entering episode length in as a second block after all other predictors were included in the model. The R^2 for the first model was .24, which increased to .34 in the second model when episode length was added. This change in R^2 was statistically significant ($F(1, 57) = 7.72, p < .01$), suggesting that episode length accounted for 9% of the total variance in reading fluency scores above and beyond the variance accounted for by nonverbal IQ, gender, age, and episode balance.

Chapter 5: Discussion

The results from this study underscore the importance of social interaction, not only for children's oral language development, but for written language development as well. The consistent findings across the three regression models provide strong evidence that children's early language experiences relate to later reading ability. Additionally, this study provides evidence for the value of examining the intersubjectivity between parent and child and quantifying the effects of the social interaction.

The analysis tested the predictability of intersubjective factors on three levels of reading ability: emergent literacy skills, letter naming and word reading, and fluency in reading a passage. As expected, episode length related positively to children's reading fluency scores. As mentioned previously, the theoretical basis for this relationship stems from the fact that being a fluent reader requires more than honed decoding skills. Fluency requires that one make meaning of the text one is reading. This is true even if the message of the text is beyond the reader's comprehension level, as fluency requires that readers—at a minimum—extract linguistic meaning embedded in word forms and sentence structure. Because this element of meaning-making is embedded in measures of fluency, it was expected that the two intersubjective predictors would exhibit a positive relationship with students' first grade reading scores on the GORT fluency test. However, of these two primary variables of interest, only episode length was a statistically significant predictor. Episode balance was not determined to be related to reading fluency. Nevertheless, it is worth mentioning the possibility that this study was underpowered to detect such a relationship, especially given the fact that a more stringent alpha level was used to test

statistical significance. Further research in more adequately powered studies may help clarify whether this facet of intersubjectivity is related to literacy development.

Intriguingly, a positive relationship of similar strength to that found with reading fluency was found between intersubjectivity and the letter naming and word reading test in first grade. In fact, the unique variance accounted for by episode length was virtually equivalent for the beginning reading and reading fluency outcomes. These results suggest that the strength of the relationship between episode length and these two outcomes, as assessed in these models, is practically the same. This runs somewhat counter to the hypothesized relationships, as a stronger relationship was expected to exist between intersubjectivity and reading fluency. However, the observed results are not entirely incompatible with the hypothesized results given that these two dependent variables are highly related. Furthermore, these two assessments were given at the same sitting, and so it is reasonable to assume that the same children who did well on the letter naming and word reading assessment did similarly well on the reading fluency test. This said, it is possible that with a larger sample size that enabled a broader range of outcome scores that some differences in the strength of the relationships would be detected.

The failure to reject the null hypothesis regarding the relationship between intersubjectivity and emergent literacy is not surprising. Researchers have long theorized the relationship between oral language and literacy to be weaker during the beginning stages of literacy acquisition when there is less emphasis on comprehension (e.g., Snow et al., 1995). These early literacy skills have more to do with a burgeoning awareness of written texts and how to use them than they do with constructing meaning by engaging with the texts, especially when compared with more advanced literacy skills like those assessed by the first grade measures in this study. However, these emergent literacy skills

are not by any means devoid of meaning-making. In fact, it can easily be argued that meaning-making is crucial if these early skills are to blossom and evolve into more advanced reading ability. Few would argue against the idea that the literacy awareness skills (print awareness, phonemic awareness, awareness of the alphabet, etc.) that define emergent literacy is effectively the beginning of meaning-making processes with written texts. For example, one aspect of print awareness is the idea that children understand that the words on a page have meaning, that there is information to be had from reading them. Thus, further research is needed to understand better the relationship between intersubjectivity and the various areas of literacy development, including emergent literacy. In particular, an important next step would be to conduct a path analysis of the variables included in this study. In this way, potential moderating and mediating relationships could be better detected and understood. For example, it may be that emergent literacy mediates the relationship between early intersubjective experiences and beginning reading skills.

THEORETICAL IMPLICATIONS

The results of this study support the notion that social interaction is an important part of both language and literacy development. Social interactionist research has investigated the ways that the social environment shapes the child's development in these two domains. In quantitative studies, this has been done mainly through measuring some aspect of the parent's or teacher's talk and examining the relationship of that measure with outcomes in the child. The current study uniquely contributes to that field of research by presenting a new method for measuring language interaction, one that I argue aligns better with the core ideas of social interactionist theory. By measuring the length of joint attention episodes, I was able to quantify the extent to which conversational contributions from both

the parent and child resulted in meaning co-construction of greater complexity. Because this method of measuring language does not isolate the individual contributions of the speakers, it is less a measure of linguistic meaning (i.e., the meaning inherent in the words and structure of utterances), which is additive in nature, and more a measure of the intersubjective work of the interlocutors, which is greater than the sum of each contributor's linguistic meaning. Thus, the phenomenon being measured here is the result of what has elsewhere been termed, *interpersonal synergy* (Fusaroli, Gangopadhyay, & Tylén, 2014), which encompasses the idea that two minds can do together what neither can do alone.

When the goal is to determine how or to what extent social interaction influences children's language and literacy development, it is important for researchers to consider how the interaction is assessed. Separate measures of parent and child language production cannot constitute a measure of interaction. This is an important distinction to be made if we are to view social interactionism not as a theory of language input but a theory of dynamic interpersonal behavior.

I should note that it is *not* that social interactionists have neglected to consider this point or failed to account for the interactive nature of oral language. In fact, it is somewhat ironic that a similar point to the one I am making here has been made by social interaction theorists since the early era of the theory's development. Referring to the mothers' speech research of the 1970s, Catherine Snow noted:

> The early mothers' speech studies (and too many of the more recent ones as well) paid little or no attention to what the child was saying or doing. The notion that mothers' speech, like children's speech, occurs in conversations, and that the need to communicate with one's conversational partner affects the structure of one's utterances, had not yet affected the way research into mothers' speech was carried out. (Snow, 1977, p. 32)

Snow went on to say that as this research continued to develop, studies showed that mothers' speech varied from one context to another, which "made it clear that mothers' speech could not be characterized as a single corpus, but must be seen as the product of specific interactions between mothers and their children."

The work of Catherine Snow and others since that time has been instrumental in steering the field to focus on how parent speech interacts with child speech. For example, researchers have considered ways in which parent talk is semantically contingent on what the child says (Cross, 1978; Golinkoff, Can, Soderstrom, & Hirsh-Pasek, 2015; Roseberry, Hirsh-Pasek, & Golinkoff, 2014; Snow, 1983). Semantically contingent utterances are defined as adult utterances that continue the topic introduced by the child (Snow, 1983). Quantifying this type of construct, however, results in a measure of adult talk that, although affected by the child's speech, is still not a measure of the adult-child language interaction itself. Therefore, the current study holds important implications for theory and research in this field as it introduces a method of characterizing and quantifying social language interaction and provides empirical evidence of the relationship between that interaction and children's literacy development. To my knowledge, this study is the first to quantify the relationship between early oral language and literacy by measuring some aspect of the co-constructed product of language interactions rather than measuring each speakers' language production separately.

LIMITATIONS

Unaccounted cultural influences

It should be noted that this study does not account for differing cultural influences and beliefs. Social norms for how to converse with others, including expectations for how

children should or should not speak to adults, vary widely across cultures. Caution should be taken, therefore, in generalizing these findings to more culturally diverse populations. Further research is needed to investigate how these and other aspects of interpersonal engagement differ across cultures and how these differences should inform the assumptions we make about the relationships between social interaction, language, and literacy.

Unmeasured covariates

There are several covariates that could help strengthen the validity and credibility of the findings if they were added to the models. These include ethnicity, parent education, and family income. Unfortunately, this information was unavailable to me, though it was used by the researchers of the original study. I do not know what relationship there may be between these three covariates and the first grade measures in this study because I have found no report of any analysis within the HSLLD that includes participants' WRAT or GORT scores as variables. However, relationships between these covariates and the kindergarten measures of emergent literacy has been reported (see Dickinson & Tabors, 2001). No statistically significant correlation was found between emergent literacy and ethnicity nor between emergent literacy and mother education. However, there was a weak, positive correlation between emergent literacy and family income that was statistically significant ($R = .23$, $p < .05$). As mentioned previously, the families participating in the HSLLD study were all considered to be of low socioeconomic status. Yet, there still appears to be a relationship between family income and at least one of the outcomes assessed in the current study, even within this restricted range. For this reason, further investigation that controls for these other covariates is warranted.

Secondary data

There are several challenges with using archival data, including the potential for unknown factors to influence outcomes. Because I did not collect the data myself, I am unable to see to the assurance of its quality and validity. However, the original investigators were careful to document data collection procedures in a thorough and transparent way. Furthermore, including the language samples from the original study in the CHILDES database online required that the language transcription adhere to strict guidelines regarding its format and the symbols used.

Absence of audiovisual data

Because the language transcriptions did not include accompanying video or audio files, I was unable to view directly the interactions I was analyzing. The disadvantage of this is that there may be certain aspects of those interactions that can only be observed visually, such as the direction of interlocutors' gaze or any gestures that they make. However, this limitation is at least partially overcome by the fact that investigators took field notes during the recordings, attempting to document important non-verbal aspects of the interaction. These notes were then inserted into the transcriptions as guiding information to explain the action that was taking place. Additionally, the transcription format and symbols mentioned above allow for many kinds of nonverbal actions and interactions to be encoded directly into the transcriptions themselves.

Quantifying the qualitatively complex

Lastly, it is important to mention that quantifying language data has the unfortunate result of reducing the qualitatively rich conversations of real people to abstract numbers. Of course, there are advantages to quantifying such interactions, and this study has sought to capitalize on those advantages by providing a more objective, straightforward means of

measuring the complexity of co-constructed ideas than might be had from a purely qualitative assessment of the data. Nonetheless, these advantages come at a cost because predetermined methods of quantitative measurement limit what can be uncovered in the data and constrain how one can interpret what is uncovered. The implication this has for the current study is that the method used here represents one of potentially myriad distinct ways of examining parent-child intersubjectivity. Consequently, the findings of this study likely constitute a relatively small piece of a very large puzzle. More research—of both similar and divergent methodologies, and of both qualitative and quantitative designs — will help overcome this limitation by providing alternative perspectives from which to examine these early social interactions.

CONCLUSION

This study examined the relationship between oral language and literacy development in young children. Situated in a sociocultural framework of child development and a social interactionist framework of language development, the purpose of this study was twofold: 1) to elucidate the connections between early intersubjective language experiences and learning to read, and 2) to investigate the viability of a new way of analyzing adult-child talk within a social interactionist perspective. Accordingly, the results of this study contribute to extant research by providing further insight into the connection between oral language and literacy and substantiating the rationale for measuring language by quantifying the social interaction between speakers.

In this study, the intersubjectivity of parent-child interactions was measured by first distinguishing between talk occurring inside versus outside joint attention episodes and delineating the beginning and end of each episode. This effective grouping of utterances by topic and semantic contingency allowed for counts of turns and utterances within

episodes to reflect the extent to which ideas were co-constructed and then further extended and developed, thus providing a measure of the synergistic effects of the parent's and child's contributions to the conversation. In addition, the fact that the data were collected across multiple years provides a basis for arguing that the measures drawn from these data and averaged over time are, to a reasonable extent, representative of the kinds of interactions these children typically experienced during their early childhood. Thus, the longitudinal nature of the data, together with the moderate, positive relationships exhibited by the models, provide strong evidence that early intersubjective oral language experiences are important for literacy development.

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